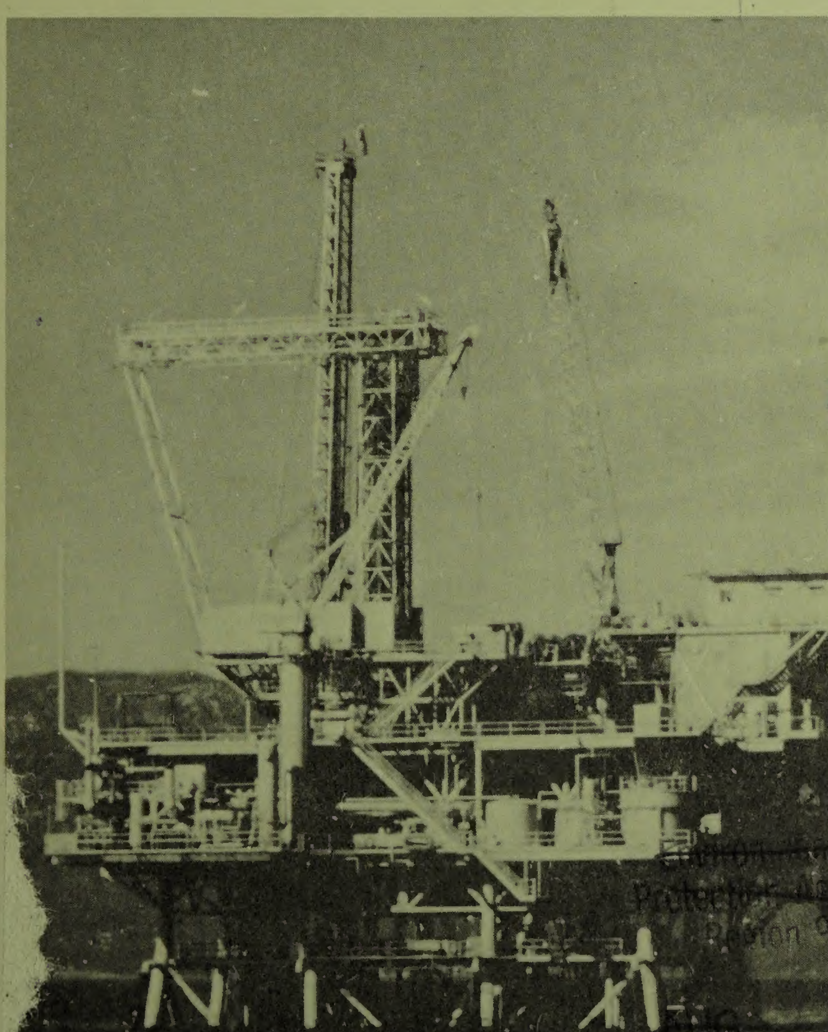
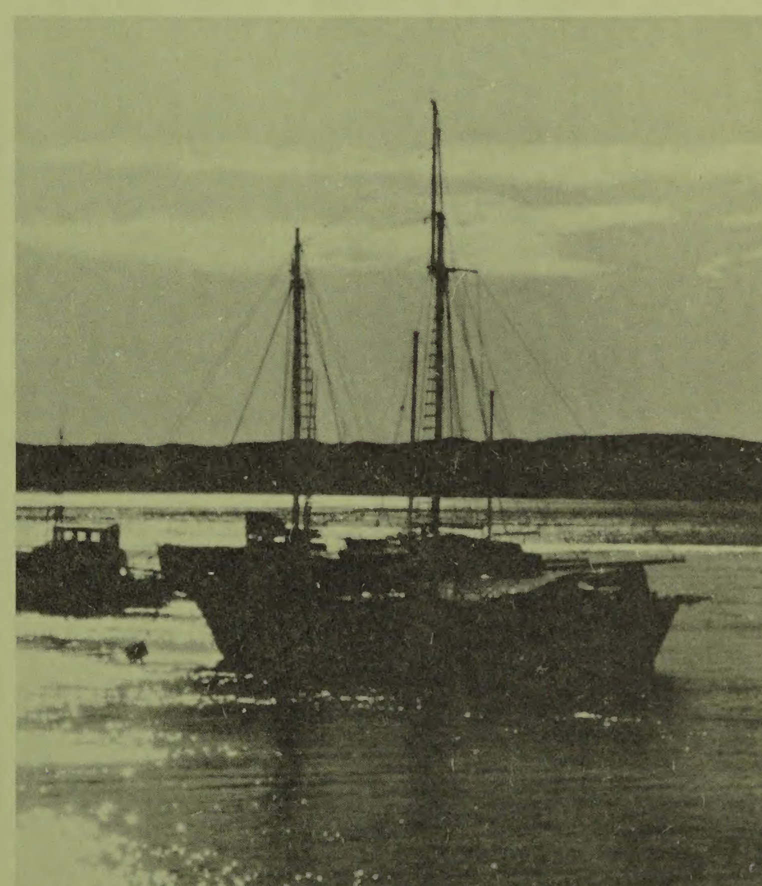
DEPARTMENT OF THE INTERIOR / MINERALS MANAGEMENT SERVICE

FINAL
VOLUME I
ENVIRONMENTAL IMPACT STATEMENT

OCS SALE NO. 73

PROPOSED 1983 OUTER CONTINENTAL SHELF
OIL AND GAS LEASE SALE OFFSHORE
CENTRAL CALIFORNIA





Prepared by the Minerals Management Service
Pacific OCS Region
1340 West Sixth Street, Los Angeles, California 90017

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June 1983

FINAL ENVIRONMENTAL IMPACT STATEMENT
Proposed Outer Continental Shelf Oil and Gas Lease
Sale No. 73 Central California

SUMMARY

I. Preliminary Information

Proposed OCS Oil and Gas Lease Sale No. 73 Central California

Type of Action:

Administrative (x) Legislative ( )

Lead Agency:

United States Department of the Interior
Minerals Management Service
Pacific Outer Continental Shelf Region
1340 West Sixth Street
Los Angeles, California 90017

Contact:

John Lane or Debra Agnolet
Minerals Management Service
Pacific Outer Continental Shelf Region
1340 West Sixth Street
Los Angeles, California 90017
(213) 688-6619 or 688-7234

Dan Henry
Minerals Management Service
18th & C Streets, N.W.
Washington, D.C. 20240
(202) 343-6264

II. Description of the Area and Proposed Action

The proposed action (Alternative I) is offering for lease those unleased tracts from Point Conception through Row N 816 UTM Grid System and within the western boundary of the Call for Nominations and Comments (see Figure II.A.1.a-1). The proposed action has been designated as Proposed OCS Oil and Gas Lease Sale No. 73 Central California. The tracts are located 3 to 66 miles offshore in water depths ranging from 50 to over 3,500 meters (see Figures II.A.1.a-2). Approximately 2 million acres (814,000 hectares) or 360 tracts are located within the boundary of the proposed sale area. Situated within the proposed sale area are 55 leased tracts from OCS Sale No. 53, and 10 leased tracts from RS-2. In the unlikely event any of the previously leased tracts are relinquished prior to the sale, they will be considered for leasing.

The analysis of expected impacts for Alternative I and subsequent Alternatives are based uon the Most Likely Resource Estimates, associated exploration, development and production, and Transportation Scenario No. 1. The Most Likely Resource Estimates and associated development and transportation scenarios in conjunction with the development from other projects and proposals within the proposed sale area and development from existing leased tracts provide the basis for the analysis of potential cumulative impacts. The Conditional Mean Resource estimates, associated development and transportation scenarios provide the basis for a "Total Development" analysis.

RESOURCE ESTIMATES

	BBO	TCFG
Most Likely Resource Estimate	0.291	0.285
Conditional Mean Resource Estimate	0.970	0.950

III. Issues and Areas of Concern

As authorized by the OCS Lands Act, as amended, the Department of the Interior serves as the primary FEderal agency administering leases on the Outer Continental Shelf. Department of the Interior agencies are in constant coordination with each other throughout the presale processes and the production phases, as well as coordinating as appropriate with other Federal, State, local, and non-governmental agencies and organizations. The scoping process and oordination with other Federal agencies identified the following environmental issues and areas as requiring special attention and emphasis in the environmental assessment process:

Physical Environmental

General Issues
Geologic Hazards
Water Quality
Ocean Dumping
Air Quality

Biological Environmental

General Issues
Intertidal Benthos
Subtidal Benthos
Fish
Marine Mammals
Seabirds
Endangered and Threatened Species
Estuaries and Wetlands
Areas of Special Concern
Point Reyes/Marine Sanctuaries

Socioeconomic

General Issues
Demography
Coastal Economy
Public Services and Facilities
Coastal Land Use
Commercial Fisheries
Sportfishing
Recreation
Tourism
Visual Resources
Cultural Resources
Ports and Harbors
Marine Traffic
Refineries
Offshore Structures
Military Uses

IV. Alternatives

A. Alternative I (Proposed Action)

The analysis of expected impacts were based upon the Most Likely Resource Estimates, associated Exploration, Development and Production of the resources, and Transportation Scenario No. 1 (Yamasaki, 1983). All applicable laws, regulations and Pacific OCS orders (see Section I.D. and E and Section IV.B) were considered in place during the analysis. A detailed discussion of the expected impacts is presented in Section IV.E. In the analysis, oil spills were assumed expected when the Oil Spill Analysis Model predicted a 25 percent probability or greater of one or more spills occurring and contacting land segments or targets.

The actual environmental risk may prove higher or lower due to the extremely difficult nature of predicting oil spills and their movements, and the many parameters called for by the model. Therefore, potential impacts as a result of an oil spill are also presented in Section IV.E.

With the exception of impacts to issues discribed below the analysis of the issues listed above were found to have low or very low impacts as a result of the proposed action.

Physical Environment. Impacts to water quality are expected to be low to very low with the expection of short-term (days to weeks) moderate effects resulting from the one expected oil spill.

The impacts from hazardous dump site could be very high if bottom disturbing activities, in the hazardous waste dump site areas, contact waste containers. Application of the Hazardous Waste Stipulation would mitigate this impact by reducing the likelihood of disturbing activities contact with waste containers.

Air quality impacts could range from low to moderate for coastal regions adjacent to the proposed sale area. It is likely, therefore, that OCS facilities associated with Proposed Sale No. 73 would be required under Department of the Interior air quality regulations to apply emission controls. Application of emission controls would reduce the moderate predicted impacts to low.

Biological Environment. The Channel Islands National Marine Sanctuary is expected to experience impacts from an oil spill. As a result of this expected spill, California seabird species and the northern fur seal are expected to receive impacts. Impacts to the California seabird populations are expected to range from low to moderate (mortality of the California population of a species requiring 5-10 years for recovery) due to an oil spill expected to contact the buffer zone around the northern Channel Islands. The California northern fur seal population is expected to have a high impact (25 percent mortality of the California population) if a spill occurs during spring and summer pupping or breeding season.

Socioeconomic Environment. The impacts to public services and facilities would be moderate (short-term stress of local systems that may be accommodated through time and with small use adjustments). Expected impacts to water supply systems would be high (significant short-term and some long-term impacts requiring modification of existing systems or construction of new facilities) for the proposed sale area.

High impacts to Port San Luis would be expected, primarily due to competition for vessel berth space and support facilities. This competition would lead to the need for additional docks, berths, and facilities.

The proposal is expected to result in moderate (10-20 percent economic loss) to trawl fishermen in the proposed sale area for at least three years primarily during years of peak activity.

B. Alternatives to the Proposed Action

1. Alternative II - Modify the Sale to Protect Sensitive Biological Resources in the Morro Bay Area

Alternative II would modify the proposed sale area by deferring from leasing in the proposed sale area, three tracts and those portion of four tracts which coincide with a 10-mile zone centered on Morro Bay.

This alternative provides additional protection to the intertidal benthos, subtidal benthos, fish, seabirds, endangered and threatened species, estuaries and wetlands, commercial fisheries, sportfishing, recreation, tourism, visual resources and ports and harbors. This added protection is due to increased time for weathering, diversion and clean-up before a potential spill from OCS platforms or related activities could contact these resources. This Alternative would also insure that subtidal benthos, and visual and cultural resources will not experience impacts in the deferred area due to platform placement. This Alternative will have no effect on the remaining resource categories, or areas outside the Alternative.

2. Alternative III - Modify the Sale to Protect Sensitive Resources in the Central San Luis Obispo County Coastal Area

Alternative III would modify the proposed sale by deferring from leasing 29 tracts located offshore the central portion of San Luis Obispo County coast. With the adoption of this Alternative, the Most Likely Resource estimate of the total undiscovered recoverable oil and gas that would remain in the proposed sale area would be reduced, relative to the proposal, by 28% for oil resources and 26% for gas resources. This reduction in oil and gas resources will require one less platform (20% reduction) to develop the remaining oil and gas resources.

Adoption of this Alternative would significantly reduce the localized expected impacts to trawl fishermen who fish in the Alternative area. This Alternative would remove 27 tracts that overlap commercial trawl grounds, including 10 that overlap an important shrimp trawl area. In 1981, roughly half of all fishing effort in the proposed sale area for the Pacific Ocean shrimp occurred in these tracts.

Elimination of the one platform would reduce local subtidal benthos impacts from high to very low by eliminating bottom disruptions. Resources that would experience small reductions in expected local impacts due to elimination of the one platform, and boat and aircraft traffic are water quality, air quality, marine mammals, seabirds, endangered species, recreation and tourism, visual, and ports and harbors. Cultural resources would additionally be protected.

In addition, highly sensitive biological resources such as the southern sea otter will be given increased protection from OCS related oil spills. Other biological resources that will benefit from the increased pollution include the benthos, marine mammals, seabirds, endangered and threatened species and sportfisheries.

3. Alternative IV - Modify the Sale to Protect Sensitive Areas

Alternative IV would modify the Sale by eliminating 15 tracts located between Point San Luis and Purisma Point. With the adoption of this Alternative the Most Likely Resouce estimate of the total undiscovered recoverable oil, which would remain in the proposed sale area would be reduced by 3%, relative to the proposal.

No decrease in the estimated gas resources or number of platforms are expected through the adoption of this Alternative.

Adoption of this Alternative would significantly reduce expected localized impacts to trawl and set gear fishermen who fish in the Alternative area.

Resources that would experience small reduction in the expected local impacts due to elimination of OCS hydrocarbon activities in the Alternative area include water quality, southern sea otters, recreation and ports and harbors. This Alternative would also insure no degradation of cultural resources in the Alternative area.

In addition, highly sensitive biological resources such as the southern sea otter, brown pelican and California least tern will be given increased protection from OCS related oil spills. Other resources that will benefit from the increased protection provided by this Alternative include rocky intertidal, Pismo Beach, fish, fisheries, sportfishing, recreation, tourism and visual resources.

4. Alternative V - Delay the Sale

If this Alternative is chosen, tracts would be withheld from a sale offering for a certain period of time. The period of delay would be governed by the reason for not leasing at the present time. Postponement of the Proposed Sale No. 73 would result in delay in the exploration, development and production of oil and gas resources. Impacts that could result from the proposal would not occur until the proposal is reinstated.

5. Alternative VI - No Sale

This Alternative removes the total area for proposed leasing at this time. All physical, biological, and socioeconomic impacts resulting from hydrocarbon exploration and development from proposed Sale No. 73 would be eliminated at this time.

Although cancelling Proposed Sale No. 73 would eliminate all the impacts that are expected as a result of the proposal, impacts from oil and gas activities within the region would still result from existing oil and gas activities from the previous OCS Sale No. 53, State Tidelands leasing and development, future OCS Lease Sales in this area, as well as importation of oil via tankers to refineries in the area.

Changes to the Physical, Biological and Socioeconomic resources over the next 25 years without the proposal and future OCS Lease Sales, would still occur. Population expansion and associated impacts will continue, and would be directly or indirectly responsible for most problems and benefits associated with non-oil related changes in Central California.

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PURPOSE AND NEED FOR ACTION

I.

CHAPTER I

I. PURPOSE AND NEED FOR ACTION

A. Purpose and Need for Action

The Department of the Interior is required by law to manage the exploration and development of oil and gas resources on the Outer Continental Shelf (OCS). To help meet the energy needs of the nation in an environmentally safe manner, these resources must be developed as rapidly and yet as carefully as possible. While overseeing this development, the Federal Government must balance orderly resource development with protection of the human, marine, and coastal environments, ensure that the public receive a fair return for these resources, and preserve and maintain free enterprise competition.

In compliance with the Outer Continental Shelf Lands Act, as amended, the Secretary of the Interior, prior to approval, submits a proposed 5-year leasing program to the Congress, the Attorney General, and the governors of affected states. The Secretary further reviews, periodically revises as necessary, and maintains the oil and gas leasing program. Goals of the leasing program include the orderly development of OCS oil and gas resources in an environmentally acceptable manner and to maintain an adequate contribution of OCS production to the national supply in order to reduce dependence on foreign oil.

Full development of OCS resources is an integral part of the National Energy Plan (Executive Office of the President, Energy Policy and Planning, 1977). The United States has three overriding energy objectives outlined in that plan:

> As an immediate objective that will become even more important in the future, reduce dependence on foreign oil and vulnerability to supply interruptions;
>
> In the medium-term, keep U.S. imports sufficiently low to weather the period when world oil production approaches its capacity limitation; and
>
> In the long-term, have renewable and essentially inexhaustible sources of energy for sustained economic growth.

The OCS leasing program does <u>not</u> represent a decision to lease in a particular area. It represents only the Department's intent to consider leasing in certain areas, and to proceed with the leasing of such areas only if it should be determined that leasing and development would be environmentally, technically, and economically acceptable.

This EIS and the environmental review process are structured to assess the potential impacts to the environment of oil and gas operations in the proposed sale area. The facility locations and transportation scenarios described represent assumptions that were made for purposes of analysis and serve as a basis for identifying characteristic activities and any resulting environmental impacts and multiple-use conflicts. These assumptions do not represent a recommendation, preference, or endorsement of any facility, site, or development plan. This EIS should not be construed as, or used for, a local planning document. Local control of some events may be exercised through applicable State and local laws and ordinances regarding land ownership, planning, and zoning.

B. Administrative Events Leading Up to the Proposal

The OCS Lands Act, as amended, gives the Department of the Interior the responsibility for administering mineral development on the OCS. The process by which oil and gas resources are leased for development is multiphased with many opportunities for interaction between Federal agencies, State and local governments, concerned citizens, groups, and industries. The steps in proposed Lease Sale No. 73 leasing process are a combination of administrative events of two separate processes: the administrative process in place prior to July 1982 and "streamlining". A discussion of the new process of "streamlining" can be found in the Final Supplement to the Final Five Year OCS Oil and Gas Leasing Schedule EIS (BLM, 1982). All steps legally required and mandated will occur during the process of offering for lease areas off Central California. The administrative steps as they have taken or will take place for proposed Lease Sale No. 73 are as follows:

1. Oil and Gas Leasing Schedule: The OCS Lands Act, as amended, requires the Secretary of the Department of the Interior to prepare "...an oil and gas leasing program...(which) shall consist of a schedule of proposed lease sales indicating...the size, timing, and location of leasing activity which...will best meet national energy needs for the five year period...."

The current five year schedule covers the years 1982 to 1987 and was approved July 1982. It replaces the program approved in June 1980 covering the period time from mid-1980 through mid-1985. On October 6, 1981, the U.S. Court of Appeals for the District of Columbia Circuit issued a decision on litigation involving the five year program adopted in June 1980. The court remanded the June 1980 program and its administrative record for revision in accordance with the OCS Lands Act. The tentative proposed final program was announced March 15, 1982, in accord with the court's October 6, 1981 order and a subsequent January 19, 1982 clarification order. The proposed final program was submitted May 11, 1982 to the President and the Congress for a 60-day notification period. The current five year program has been challenged and is in litigation before the U.S. District Court.

Environmental Impact Statements were prepared for both schedules. The Final Environmental Impact Statement (FEIS) for the June 1980 schedule was released to the public in January 1980. The Final supplement to the FEIS was released March 1982, and covers the July 1982 schedule. The Final supplement discusses the differences between the anticipated environmental impacts of the June 1980 schedule and the July 1982 schedule. It also presents a discussion of "streamlining."

The five year OCS leasing program does not represent a decision to lease in a particular area. It represents only the Department's intent to consider leasing certain areas, and to proceed with the leasing of such areas if it should be determined that leasing and development in such areas would be environmentally acceptable and technically feasible.

2. Request for Resource Reports: On July 31, 1980, the Bureau of Land Management (BLM) sent requests for resource reports to 52 agencies and groups. Information was requested on resources and other uses of the OCS from the U.S.- Mexico International Boundary to the California-Oregon State Boundary and the possible impacts from oil and gas exploration and development. Suggestions for resolution of any conflicts were also requested. Responses were received from eleven Federal agencies, four State agencies, thirteen counties and one city (Refer to Section V, Consultation and Coordination).

3. Call for Nominations and Comments: On November 11, 1980, the Bureau of Land Management published in the Federal Register a Call for Nominations and Comments (45 F.R., 79402, November 11, 1980). The Call area extended from the U.S.A.-Mexico Border to the Oregon-California Boundary and included approximately 4,500 blocks covering 24.1 million acres. Water depths ranged to 12,000 feet (3,800 m). Areas excluded from the call were: 1) Dana Point to San Diego; 2) Channel Islands National Marine Sanctuary; 3) tracts in the northern basins: Eel River, Point Arena, Bodega, and Santa Cruz; 4) Point Reyes Wilderness Area; 5) tracts within 3 miles of State waters from Point Ano Nuevo to Point Sur; and 6) Point Reyes/Farallon Islands Marine Sanctuary. Fifteen companies submitted nominations and 1,680 written comments including 1,543 post cards, were received.

4. Area Identification: On May 5, 1982, DOI announced the study area for the proposed Lease Sale No. 73 environmental impact study to be limited to areas three to 75 miles offshore California, from Point Conception north to the California-Oregon State line. Deleted from the study area were tracts in the Eel River, Point Arena, Bodega and Santa Cruz Basins, blocks in areas surrounding the Farallon Island Marine Sanctuary, Point Reyes Wilderness area, and blocks within three miles of State waters from Point Ano Nuevo to Point Sur. A map depicting the study area was released. No itemized listing of the tracts or the blocks comprising the study area was made.

5. Notice of Intent and Scoping: On December 30, 1982 a Notice of Intent (NOI) to prepare an EIS was released for proposed Lease Sale No. 73. The NOI announced that the EIS would focus on the potential impacts of leasing, exploration, and development in the southern portion of the Santa Maria Basin. The reduction of the proposed sale area was based upon 1983 appropriations (P.L. 97-394) which prohibited expenditures of funds by the Department of the Interior for the procurement, leasing, bidding, exploration or development of lands north of Row N816. This provided the opportunity for Federal, State, and local governments and agencies, industry, organizations and individuals to submit comments on the scope and issues needed to be addressed in the EIS. Comments were due January 31, 1983, and 725 comments were received. See Section I.F. for a discussion of the scoping process.

6. Draft EIS and Subsequent Public Hearings: The Draft EIS was filed with the Environmental Protection Agency on March 3, 1983 and simultaneously released for review to Federal, State, and local jurisdictions and agencies, individuals and interest groups. Public hearings were held on April 13, 1983 at the Vandenberg Inn in Santa Maria, California. Oral testimony was taken from 191 individuals representing State, county, city, and local jurisdictions and agencies, industry, environmental groups, other special

interest groups and individuals. Written comments on the Draft EIS were accepted until April 26, 1983. Comments were received from 289 persons representing governments, agencies, interest groups and individuals.

7. Section 7 Consultation, Endangered Species: As required by the Endangered Species Act of 1973, as amended, Minerals Management Service (MMS) is consulting with U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) to ensure that proposed Lease Sale No. 73 is not likely to jeopardize the continued existence of endangered or threatened species, or destroy or adversely modify the critical habitat of such species. The biological opinions to be provided by FWS and NMFS will be included in the FEIS. Consultation will be continued until all issues are resolved. As required under the Endangered Species Act of 1973, as amended, Section 7 consultation will continue, as needed, and may be related to development and production phases after the proposed sale.

8. Final EIS and Proposed Notice of Sale: The FEIS will reflect Department of the Interior's consideration of all comments received from the public and Federal, State, and local officials. The Final Environmental Impact Statement is filed with the Environmental Protection Agency and a 30-day waiting period must follow before any decision is possible. None of the steps outlined above constitutes a decision to hold a sale. A Proposed Notice of Sale, published after the EIS is finalized, contains information on blocks or tracts tentatively considered for sale. Also in the Proposed Notice is a listing of the stipulations proposed to be attached to any individual block or tract.

9. Coordination with the State: Section 19 of the OCS Lands Act, as amended, provides for coordination and consultation with affected State and local governments. If the Secretary of the Interior makes a preliminary decision to hold a sale, the Governor of the affected State may submit recommendations to the Secretary regarding the size, timing, or location of the proposed lease sale. Such recommendations are submitted within 60 days after the publication of the Notice of Sale in the Federal Register. Thereafter, the Secretary of the Interior will respond to the "...Governor's recommendations, or ... implement any alternative means identified in consultation with the Governor to provide for a reasonable balance between the national interest and the well-being of the citizens of the affected State." (OCSLAA, as amended)

In response to the U.S. Appeals Court's decision in California v James Watt 683 F. 2d ;253 (9th Cir. 1982), cert. granted, 52 U.S.L.W. 3818 (U.S. May 16, 1983)(No. 82-1326). the Department of the Interior undertakes an additional coordinating step by preparing a determination of consistency of the proposed action with the State's approved coastal management plan. California's Coastal Management Plan was approved in 1976. The consistency determination is sent to the State for concurrence 90 days prior to the Secretarial decision to conduct the sale.

10. Notice of Sale: If a final decision to hold the sale is then made by the Secretary of the Interior, he will specify what tracts or blocks shall be offered and what terms and conditions are to be imposed on lease purchasers. The Notice of Sale is published in the Federal Register at least 30 days prior to the Sale. The Notice of Sale for proposed Lease Sale No. 73 73 is tentatively scheduled to be issued in September, 1983.

11. Sale: Outer Continental Shelf oil and gas lease sales are open to the public. Proposed Lease Sale No. 73 is tentatively scheduled for October 1983. However, this schedule is subject to revision by the Secretary of the Interior.

12. Activity After a Sale: Continued formal and informal contacts with the State for future planning and discussion of onshore facilities are conducted, as well as coordination under Department of the Interior Manual 655 with FWS and National Park Service (NPS). Further information is provided in Section I.B.7.

13. Environmental Monitoring: Minerals Management Service (MMS) will consider environmental monitoring studies for the areas leased as a result of a sale. Each area will be evaluated on a case-by-case basis to design an effective monitoring program responsive to management questions. Special monitoring studies may be required for areas identified as having a special resource value. Appropriate State officials are contacted on a continuing basis in a consulting capacity. MMS will provide for a free flow of information to keep the State informed of the status of any monitoring program. The State will be informed through the OCS Advisory Board, through State liaison officers, and through the activities of the Pacific Outer Continental Shelf Regional Office.

C. Leasing History

The leasing history for offshore Central and Northern California is presented on Graphic No. 1, Leasing History. This graphic shows all tracts which have been, or are currently, leased and those tracts which have been deleted from consideration for proposed Lease Sale No. 73 and previous sales. The numbers of tracts offered, leased, and terminated are presented in Table IV.C.1.4. Tracts deleted from one sale may have been considered for lease in a subsequent sale. A listing of these deleted tracts and the reasons for their deletion from the proposed sale are presented in Appendix B.

Offshore oil and gas exploration and development in California began in 1896 when the first shallow well was drilled from a pier offshore Summerland in Santa Barbara County. In 1929, the State of California began issuing oil and gas leases for submerged lands offshore California. However, it was not until May 14, 1963 when the first Federal oil and gas lease sale was held in the Pacific OCS Region.

1963 Sale. The Call for Nominations for the 1963 sale covered four million acres off the coast of Central and Northern California. From the 174 tracts nominated, 129 tracts were offered for lease. The tracts were grouped in four areas adjacent to Eureka, Point Arena, San Francisco, and Morro Bay. Fifty-seven of the 129 tracts offered were leased in the sale.

All the leases from the 1963 sale were relinquished between 1965 and 1967.

Sale No. 53. On May 28, 1981, the second oil and gas lease sale for Central and Northern California (OCS Lease Sale No. 53) which included portions of the areas previously offered and leased in the 1963 sale, was held. Twenty-seven oil companies nominated 1,743 blocks or approximately 8.4 million acres of submerged land. Of the nominated tracts, only 242 tracts comprising 1.3 million acres were considered in the Final EIS prepared for Lease Sale No. 53.

California, five State agencies and a coalition of environmental groups filed suits (State of California, et al., v. Watt, Civil No. 81-2080 and Natural Resource Defense Council Inc. et al., v. Watt, Civil No. 81-2081) to enjoin the Secretary of the Interior from conducting the oil and gas lease sale for 32 of the tracts. A preliminary injunction to enjoin DOI from accepting or rejecting any bids or issuing any leases on the 32 litigated tracts was issued on May 27, 1981 by the U.S. District Court for the Central District of California. The sale was held as planned on May 28, 1981 and fifty-four leases were issued with an effective date of July 1, 1981.

On August 27, 1981, the U.S. District Court for the Central District of California, held that the Secretary's decision to lease in the northern portion of the Santa Maria Basin was made in violation of the Coastal Zone Management Act of 1976. Tracts 162, 163, and 164 were removed from the litigation. Tract 163 was subsequently leased, with an effective date of September 1, 1981. DOI was permanently enjoined from awarding any leases for any of the 19 remaining tracts that received bids until DOI issued consistency determinations. DOI appealed the decision to the Ninth Circuit Court of Appeals.

On August 12, 1982, the U.S. Court of Appeals for the Ninth Circuit affirmed the District Court's decision of that the Secretary of the Interior must make the determination that Lease Sale No. 53 is consistent with the California coastal zone management plan to the maximum extent practicable. The Department of Justice petitioned the Supreme Court for a writ of certiorari in February, 1983, seeking review of the Ninth Circuit's opinion. In May, 16, 1983 the U.S. Supreme Court (granted certiorari and is scheduled to consider briefs and oral argument during the 1983-84 term).

RS-2. On August 5, 1982, a Reoffering Sale (RS-2) was held on tracts located in Central and Northern California, South Atlantic, Lower Cook Inlet/Shelikof Strait, and Mid-Atlantic OCS areas. The Central and Northern California tracts were an offering of Lease Sale No. 53 tracts which had not received bids, or which high bids were rejected. The State of California filed suit (State of California, et al., v. Watt, Civil No. 82-4304) on July 16, 1982, to prevent DOI from leasing 2 of the 27 tracts being offered. The suit was dismissed by the district court.

Of the twenty-seven tracts offered in RS-2 in the Santa Maria Basin, ten were leased and two bids were rejected. All leases were effective September 1, 1982.

D. Regulatory Framework - The Laws

OCS Lands Act. The Outer Continental Shelf Lands Act of 1953 (67 Stat. 462), as amended in 1978 (P.L. 95-372; 92 Stat. 629), established Federal jurisdiction over submerged lands on the Outer Continental Shelf (OCS) seaward of State boundaries (generally 3 geographic miles seaward of the coastline). Under the OCS Lands Act, the Secretary of the Interior is responsible for the administration of mineral exploration and development of the OCS. The Act empowers the Secretary to grant leases to the highest qualified responsible bidder(s) on the basis of sealed competitive bids and to formulate such regulations as necessary to carry out the provisions of the Act.

The Act, as amended, provides guidelines for implementing an OCS oil and gas exploration and development program. The basic goal of the Act is to expedite exploration and development of the OCS minerals in order to achieve national economic and energy policy goals, assure national security, reduce dependence on foreign sources of oil, and maintain a favorable balance of payments in world trade. With respect to implementing a leasing program, this goal is constrained by the following considerations: (1) the receipt of fair and equitable return on oil and gas resources; (2) preservation and maintenance of competition; and (3) balancing orderly energy resource development with protection of the human, marine, and coastal environments.

The Secretary of the Interior has designated the Minerals Management Service (MMS) as the administrative agency responsible for the leasing of submerged Federal lands, and for the supervision of offshore operations after lease issuance. Regulations administered by the Minerals Management Service (MMS) govern the leasing of mineral deposits on the OCS and the granting of rights -of-way for pipelines, and the conduct of mineral operations are contained in 30 CFR Part 250, and are supplemented by OCS Operating Orders on an area-specific basis.

Major requirements of the Act and its implementing regulations, many of which mitigate adverse impacts resulting from OCS leasing and development, follow:

- In the enforcement of the safety, environmental, and conservation laws and regulations, the Secretary shall cooperate with the relevant departments and agencies of the Federal Government.
- The Secretary is authorized to suspend or temporarily prohibit an operation or activity pursuant to a lease or permit.
- The Secretary is authorized to cancel a lease or permit.
- The Secretary is authorized to issue regulations for unitization, pooling, and drilling agreements.
- The Secretary is authorized to issue regulations to prevent OCS operations from adversely affecting the national ambient air quality standards.
- The Secretary may cancel a nonproducing lease for the owner's failure to comply with any of the provisions of the Act, the lease, or regulations under the Act.
- The Secretary may initiate judicial proceeding to cancel a producing lease because of the owner's failure to comply with any of the provisions of the Act, the lease, or regulations under the Act.

- Rights-of-way may be approved under such regulations and upon such conditions as may be prescribed by the Secretary, assuring maximum environmental protection by utilization of the best available and safest technologies.

- Exploration must be undertaken pursuant to an approved exploration plan. An environmental report is also submitted for review. The environmental report is used by DOI to prepare an Environmental Assessment (EA) or an EIS as necessary. No permit for drilling may be issued until all affected States with approved coastal zone management programs have concurred or been presumed to concur with the consistency determination provided by the lessee.

- Geological explorations on unleased areas of the OCS shall be allowed only if such exploration will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure, or object of historical or archaeological significance.

- Governors of affected States may submit recommendations to the Secretary regarding the size, timing, or location of a proposed lease sale, or with respect to a proposed development and production plan.

- The Secretary is authorized to enter into cooperative agreements with affected States for several purposes, including but not limited to sharing the information, joint utilization of available expertise, joint planning, review, and permitting procedures, and the formation of joint surveillance and monitoring arrangements relevant to OCS operations, both onshore and offshore.

- The Secretary shall conduct a study of any area or region included in any oil and gas sale in order to establish information needed for assessment and management of environmental impacts on the human, marine, and coastal environments of the OCS and the coastal area which may be affected by oil and gas development in such area or region.

- Subsequent to the leasing and development of any area or region, the Secretary shall conduct additional studies to establish environmental information and shall monitor the human, marine, and coastal environments of such area or region.

- The Secretary shall consider relevant environmental information in making decisions, in developing appropriate regulations and lease conditions, and in issuing operating orders.

- In exercising their respective responsibilities, the Secretary and the Secretary of the Department in which the Coast Guard is operating shall require, on all new drilling and production operations and, wherever practicable, on existing operations, the use of the best available and safest technologies (BAST). The Secretary determines the economic feasibility of utilizing the BAST.

Wherever failure of equipment would have a significant effect on safety, health, or the environment the Secretary shall require use of BAST, unless he determines that the incremental benefits are clearly insufficient to justify the incremental costs of utilizing such technologies.

° The holder of a lease or permit shall maintain all operations within such lease area or within the area covered by such permit in compliance with regulations intended to protect persons, property, and the environment on the OCS.

° The Secretary of the Interior, the Secretary of the Department in which the Coast Guard is operating, and the Secretary of the Army shall enforce safety and environmental regulations promulgated under the act. The Secretary and the Coast Guard shall promulgate regulations for on site inspections of OCS facilities.

° Any person having a valid legal interest which is or may be adversely affected may commence a civil action to compel compliance with the OCS Lands Act against any person, including the United States, for any alleged violation of any provision of the OCS Lands Act, or regulation promulgated thereunder, or terms of any permit or lease issued under the OCS Lands Act.

° The Attorney General or a U.S. Attorney may institute a civil action for a temporary restraining order, injunction, or other appropriate remedy to enforce any provisions of the OCS Lands Act, regulation or order issued under the act or any terms of a lease, license, or permit issued under the act.

° Prior to development and production of an oil and gas lease, the lessee shall submit a development and production plan to the Secretary for approval. An environmental report is also submitted for review. The environmental report is used by DOI to prepare an Environmental Assessment (EA) or an EIS as necessary.

° The Secretary shall disapprove a development and production plan if:

a. the lessee fails to demonstrate he can comply with requirements of the OCS Lands Act or other applicable Federal law;

b. activities described do not receive a consistency concurrence by a State with an approved CZM plan;

c. operations threaten national security or defense; or

d. (1) exceptional geologic conditions, exceptional values in the marine or coastal environment or other exceptional conditions exist, and that implementation of the plan would probably cause serious harm or damage to life, to property, to any mineral deposits,...or to the marine, coastal, or human environments; (2) the threat of harm or damage will not disappear or decrease to an acceptable extent within a reasonable period of time; and (3) the advantages of disapproving a plan outweigh the advantages of development and production.

- The Secretary shall not grant a license or permit for any activity in an exploration, development or production plan affecting any land or water use in the coastal zone of a State with an approved Coastal Zone Management plan, unless the State concurs or can be presumed to concur with the consistency certification accompanying such plan.

- The Secretary shall, from time to time, review each development and production plan. If the review indicates that the plan should be revised to meet the requirements of Section 25 of the OCS Lands Act, the Secretary shall require such revision.

- The Secretary shall provide affected States with information to assist them in planning for the onshore impacts of possible oil and gas development and production.

- The Secretary of the Department of Transportation shall administer the Offshore Oil Spill Pollution Fund establishing compensation for injuries caused by oil discharge from an offshore facility or vessel.

- The Secretary of the Department of Commerce shall administer the Fishermen's Contingency Fund which provides compensation for damage to fishermen's gear or vessels resulting from oil and gas exploration, development, and production.

Other laws that affect the OCS are the Endangered Species Act of 1973, the Clean Air Act of 1955, Coastal Zone Management Act of 1972, Marine Mammals Protection Act of 1972, Fish and Wildlife Coordination Act, Deepwater Port Act of 1979, and Port and Water Safety Act of 1978, to name just a few. These acts provide for the protection and safe use and development of the oceans and its resources.

E. Regulatory Framework - Agencies

Various Federal agencies have regulatory responsibilites that affect the OCS leasing program.

Department of the Interior. The Minerals Management Service is the Department of Interior agency with direct OCS regulatory and enforcement authority. MMS implements the OCS leasing regulations under 30 CFR 256 and operates with other Federal agencies to develop special stipulations that apply to either specific leases or all leases within the proposed lease areas. These stipulations address such matters as cultural and biological resources, pipeline rights-of-way, disposition of drilling wastes, and equipment identification. In addition to issuing leases, MMS issues rights-of-way for pipelines on the OCS which are not wholly contained within the boundaries of contiguous leases of the same owner or operator.

MMS also administers regulations governing lease operations, including exploration and development of the OCS under 30 CFR Part 250. These regulations are the basis for OCS Orders which apply to operations in the proposed lease area. See Section IV.B.1 for a discussion of OCS Orders for the proposed lease area. Additionally, MMS maintains jurisdiction over producer-owned gathering lines and flowlines on the OCS. These are pipelines restricted to a leasehold or unit.

The Department of the Interior has promulgated regulations describing a program for regulating air pollution from OCS operations. The final regulations which became effective as of June 2, 1980, were published in the Federal Register on March 7, 1980 and are codified as 30 CFR 250.57.

The U.S. Fish and Wildlife Service (USFWS) shares responsibility with other agencies for protection of fish and wildlife resources and their habitats, and acts in an advisory capacity in the formulation of OCS leasing stipulations. USFWS also provides recommendations to the Corps of Engineers in the issuance of Federal permits to industry for construction of navigable waters. USFWS is responsible for the protection and stewardship of certain species covered under the Endangered Species Act of 1973, as amended.

U.S. Army Corps of Engineers. The OCS Lands Act extends to the OCS the authority of the Secretary of the Defense to prevent obstruction to navigation in U.S. navigable waters. Section 10 of the Rivers and Harbors Act of 1899 requires that permits be issued for all offshore construction, including pipelines, in U.S. navigable waters.

Permits must also be issued for onshore facilities in which dredging and filling of U.S. navigable waters are involved. Structure permits for exploratory drilling vessels and for fixed and mobile platforms are issued by the Corps. Permits for structures in State waters must consider environmental requirements before the issuance pursuant to Section 404 of the Clean Water Act. Section 404 also delegates regulatory authority to the Secretary of the Army over discharge of dredged or fill material in wetlands.

Department of Transportation. The OCS Lands Act grants authority to the Coast Guard to promulgate and enforce regulations covering lighting and warning devices, safety equipment, and other safety-related matters pertaining to life and property on fixed OCS platforms and drilling vessels. Through the Coast Guard, the Department of Transportation (DOT) advises the Corps of Engineers on the issuance of permits and the placement of offshore structures. Under the Port and Waterways Safety Act of 1978, the Coast Guard has the authority to establish shipping safety fairways and other ship routing systems in which OCS structures may be prohibited. The Coast Guard also has jurisdiction to enforce the Clean Water Act on the OCS.

Under the Clean Water Act, the U.S. Coast Guard approves the procedures to be followed and the equipment used for the transfer of oil from vessel to vessel and between onshore and offshore facilities and vessels. The Coast Guard also conducts pollution surveillance patrols to detect oil discharges within territorial and contiguous waters and has enforcement authority over violations. The Coast Guard also has strike team responsibilities should an oil spill occur. The Materials Transportation Bureau (MTB) is responsible for establishing and enforcing design, construction, operation, and maintenance regulations for pipelines. The Department of Transportation's responsibility and authority is further defined in a Memorandum of Understanding between it and the Department of the Interior.

Department of Commerce. The Department of Commerce, through the National Oceanic and Atmospheric Administration (NOAA) and the National Marine Fisheries Service (NMFS), is responsible for protection of marine fishery resources and their habitats, and for providing recommendations to the Corps of Engineers regarding the issuance of permits in navigable waters. NOAA participates in making recommendations to the MMS pertaining to OCS leasing and development through a Basic Agreement for Program Coordination. MMS participates in a number of NOAA activities under the same Basic Agreement.

The Department's responsibility and authorities related to OCS development include the Fishery Conservation and Management Act of 1976, the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, the Fur Seal Act of 1966, Title II of the Marine Protection, Research, and Sanctuaries Act of 1972 ("Comprehensive Research on Ocean Dumping"), and the National Ocean Pollution Research and Development and Monitoring Act of 1978.

The Department of Commerce also administers the Coastal Zone Management Act (CZMA) of 1972, as amended, through the National Oceanic and Atmospheric Administration. The CZMA encourages the development and implementation of coastal management programs for the sound management of State coastal resources by providing a system of grants, loans, and loan guarantees to the States. Once developed, the program is then submitted to the Secretary of Commerce for approval after which the Coastal Management Program (CMP) may be implemented. California has an approved CMP which is currently being implemented. Section I.B.8.a of this document provides additional information.

Section 307 of the CZMA contains the Federal consistency provision which imposes certain requirements on Federal agencies to comply with approved State coastal zone management programs.

Section 307(c)(1) requires Federal agencies conducting or supporting activities directly affecting the coastal zone be consistent to the maximum extent practicable with a State's coastal program. NOAA's Federal consistency regulations (15 CFR 930.30-.44) require Federal agencies to review each activity to assess whether it would "directly affect" the coastal zone of a State with an approved CZM program. If the Federal activity would have direct effects, the Federal agency must prepare a consistency determination and submit it to the State. If the Federal activity would have no direct effects, the Federal agency is to make a negative determination.

In States with an approved CMP, Federal agencies are prohibited (Section 307(c)(3)(A)) from issuing licenses/permits for any activity in the coastal zone that might affect land or water uses, unless the proposed activity is certified as consistent with the CMP. In cases of alleged inconsistency, the Secretary of Commerce may override the State's objection.

Section 307(c)(3)(B) requires that no Federal license or permit for an activity described in detail in an OCS exploration plan or development and production plan which affects a land or water use in the coastal zone of a State with an approved CMP may be approved until the State has concurred with the consistency certification made by the lessee or the Secretary of Commerce has overridden the State's objections.

Finally, under Section 307(d), Federal agencies may not provide Federal assistance for proposed projects that are inconsistent with a State's coastal management program except upon certain findings by the Secretary of Commerce.

Department of Energy. With respect to Outer Continental Shelf leasing, and in consultation with the Secretary of the Interior, the Department of Energy (DOE) is authorized under the Department of Energy Organization Act of 1977 to foster increased competition for leases, to implement authorized systems of bidding, to establish due diligence requirements for OCS operations, to set rates of production, and to determine amounts of OCS gas purchased and transported. DOE has broad authority over approval, design, and economics of common carrier gas pipelines.

In addition, the Department of Energy provides support to the Leasing Liaison Committee, whose function is to coordinate leasing policies of the Department of the Interior with DOE policies.

The Federal Energy Regulatory Commission (FERC), within DOE, has the authority under the Natural Gas Act to issue certificates of public convenience and necessity for proposed projects involving the transportation or sale of natural gas in interstate commerce. All natural gas produced from the OCS is considered to be interstate and therefore, is subject to FERC jurisdiction. The Natural Gas Act, the National Environmental Policy Act, and OCS Lands Act Amendments of 1978 all grant authority for or require that the FERC investigate the environmental effects of a proposed offshore project, as well as the potential gas reserves, the need for this gas, and the availability of capital to develop this resource. Also, the FERC is primarily responsible for administering and enforcing the Natural Gas Policy Act (NGPA) of 1978. As applied to OCS matters, the NGPA provides new wellhead pricing controls for certain natural gas produced from the OCS. The FERC also grants approval of the tariff rates for transportation of oil by common-carrier pipelines.

Environmental Protection Agency. Under the Federal Water Pollution Control Act (FWPCA) Amendments of 1972, a National Pollution Discharge Elimination System (NPDES) was created and applies to discharges into the territorial seas, waters of the contiguous zone, and the oceans. The NPDES applies to fixed platforms and drillships, and any discharges from these sources would require a permit issued by the Environmental Protection Agency (EPA). Discharges of pollutants without the necessary permits from EPA are unlawful. Such an NPDES permit does not apply to discharge of pollutants from any vessels or floating craft, or subsurface injection wells for production purposes. Subsurface injection is subject to MMS regulations and operating orders.

The Clean Air Act of 1977, which amended the FWPCA, also applies to offshore operations and provides that lessees or operators may be held financially liable for damages due to oil spills. It provides for a liability up to $50

EPA is also primarily responsible for facilities not related to transportation, such as terminal and storage facilities. Permits for any discharges would be issued by EPA or designated States according to established effluent guidelines. Provisions of the Clean Water Act also apply to onshore OCS-related facilities.

F. Issues Raised as a Result of Scoping

In accordance with Council of Environmental Quality (CEQ) Regulations (40 CFR 1501.7) the scope of the issues to be addressed was determined and the identification of significant issues related to the proposed action was identified. Issues and concerns for proposed Lease Sale No. 73 were submitted by Federal, State and local agencies and interested groups and individuals (see Section V., Consultation and Coordination), during the Request for Resource Information, the Call for Nominations and Comments and as a result of Scoping. Comments referred to issued previously submitted during the comments period and public hearings for Lease Sale Nos. 53 and 68. Issues and concerns were also received from various counties and special interest groups located outside the sale area concerning exploration, development and production located outside of the proposed sale area.

During the scoping process, 725 comments including 666 post cards were received. The major topics which were identified are presented below. These topics are discussed in the EIS. For a detailed listing of the issues and concerns within these topics, see Section V.D, Consultation and Coordination.

Physical Environmental

General Issues
Geologic Hazards
Water Quality
Ocean Dumping
Air Quality

Biological Environmental

General Issues
Intertidal Benthos
Subtidal Benthos
Fish Resources
Marine Mammals
Seabirds
Endangered and Threatened Species
Estuaries and Wetlands
Areas of Special Concern
Point Reyes/Marine Sanctuaries

Socioeconomic

General Issues
Demography
Coastal Economy
Public Services and Facilities
Coastal Land Use
Commercial Fisheries
Sportfishing
Recreation
Tourism
Visual Resources
Cultural Resources
Ports and Harbors
Marine Traffic
Refineries
Offshore Structures
Military Uses

The following issues and concerns were evaluated during the review of comments submitted and were identified to be eliminated from detailed study. These issues and concerns were not considered significant or have been covered adequately by prior environmental review.

Plankton. Impacts on Plankton would be localized and short-term from hydrocarbon explorations and development activities, and from oil spills. Plankton were also previously discussed in the FEIS for OCS Lease Sale No. 53 (BLM, 1980).

The possible greater impacts to planktonic larvae of certain fish and benthic invertebrates species are discussed in Sections IV.E.2.a, b, c, and g.

Terrestrial Biota. Any onshore facilities will have to comply with the Endangered Species Act, State and/or Federal as well as County and local restrictions. Impacts should be minimized through this consultation and coordination process. The level of acceptable impact will, however, depend on the restrictions of the responsible agency at any site.

G. Environmental Studies

In 1973, MMS (formerly BLM) initiated an environmental studies program for the OCS to obtain marine and coastal environmental data relative to offshore resource development impacts. Since FY 1975, the annual Congressional Appropriations Bill for MMS has included funds for MMS's environmental studies program. The 1978 amendments to the OCS Lands Act provided the first legislative mandate for studies in support of OCS minerals development. Section 20 of this act requires the Secretary of the Interior to commence environmental studies at least 6 months prior to a lease sale in a frontier area. The ultimate goal of MMS's OCS environmental studies program is:

> "...to establish information needed for prediction, assessment, management of impacts on the human, marine, and coastal environments of the Outer Continental Shelf and the nearshore area which may be affected by oil and gas activities in such area or region." (43 CFR part 256.82)

Early in 1978, MMS commissioned an *ad hoc* advisory committee to evaluate MMS's studies program and to prepare a national study design for future studies. The national study design is a framework to develop studies based on information needs required to answer specific management questions in the OCS leasing and development process. The new national study design was adopted by MMS and the Department of the Interior's OCS Advisory Board in 1978. The result of this program design in the Central and Northern California OCS area is an annual OCS Environmental Studies Plan prepared by MMS's Pacific OCS Region with coordination and review by other Federal and State agencies, local government, industry, and the general public. The California OCS Environmental Studies Plan for Fiscal Year 1984 is available from the Pacific OCS Region. Described in the plan are MMS's past environmental studies activity in the area since 1976, ongoing studies, current procurements for FY 1983, and planned topics for FY 1984. Information on current projects and products available from past studies can be obtained from the Studies Staff Chief, Pacific OCS Region.

Appendix N briefly lists the status of current MMS-funded studies in California.

MMS recognizes the process of collecting information is a continuing one that exists for the Central California marine and coastal environment, as well as other OCS areas. The purpose of MMS's OCS studies program is to attempt to Provide the significant information r making OCS leasing and management decisions within the framework of the Department of the Interior's

OCS Leasing Schedule. MMS also recognizes that other agencies and organizations are studying the OCS and coastal environment and that the studies program should build on the results of other past and ongoing programs. Answering many questions is a lengthy and complex process. Some questions can be answered by relatively short-term studies, others only after a long-term effort, and still others may not be answered at all. MMS is planning and carrying out a long-term study effort in the California OCS and coastal area. This study effort is assembling available environmental information which is used at the various OCS leasing and development decision points and also aids in enhancing the prediction and assessment of significant impacts from proposed OCS oil and gas activities.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

II.

CHAPTER II

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. Analysis of Alternatives

1. Alternative I - The Proposed Action

a. Description of the Alternative: The proposed action (Alternative I) is offering for lease those unleased tracts from Point Conception through Row N 816 UTM Grid System and within the western boundary of the Call for Nominations and Comments (see Figure II.A.1.a-1). The proposed action has been designated as Proposed OCS Oil and Gas Lease Sale No. 73 Central California. The tracts are located 3 to 66 miles offshore in water depths ranging from 50 to over 3,500 meters (see Figure II.A.1.a-2). Approximately 2 million acres (814,000 hectares) or 360 tracts are located within the boundary of the proposed sale area. Situated within the proposed sale area are 55 leased tracts from OCS Sale No. 53, and 10 leased tracts from RS-2. In the unlikely event any of the previously leased tracts are relinquished prior to the sale, they will be considered for leasing.

Also situated within the proposed sale area, and considered as part of the proposal for the purposes of analysis in this EIS, are the 19 tracts that received bids and are currently under litigation following OCS Lease Sale No. 53, as well as the ten tracts that were included in the lawsuit but which received no bids. Although the environmental impacts of leasing these tracts are addressed in the impact analysis for this alternative, the reader should be aware that only in the unlikely event that these tracts should become unencumbered by litigation and that any rights be relinquished by the lessees, prior to the issuance of the Final Notice of Sale, thereby making them available for leasing in this sale would the potential environmental impacts identified as attributable to these tracts be expected to occur.

b. Resource Estimates for the Proposed Action: Resource estimates for Proposed Sale No. 73 were calculated based upon an analysis and review of the province petroleum geology, exploration history, volumetric-yield procedures, finding-rates studies, and structural analysis.

This evaluation assesses the undiscovered recoverable hydrocarbon potential of the proposal. It considers only conventional accumulations of oil and gas. In production from conventional reserviors, there are certain technological and economic limitations to the amount of hydrocarbons in-place that can be recovered.

Additional technologic and economic constraints apply to the conditions under which exploration and production can take place. The conditions include depth of drilling, the water depth offshore, availability of transportation and proximity to markets, and the physical environmental constraints (weather).

The end product of these calculations is the conditional mean estimate for undiscovered oil and gas resources given hydrocarbons are present for the unleased Federal OCS portion of the proposed sale area. Due to the inclusion of unidentified prospects and explorational trends in the generation of these estimates, resources are included that cannot reasonably be assumed to be

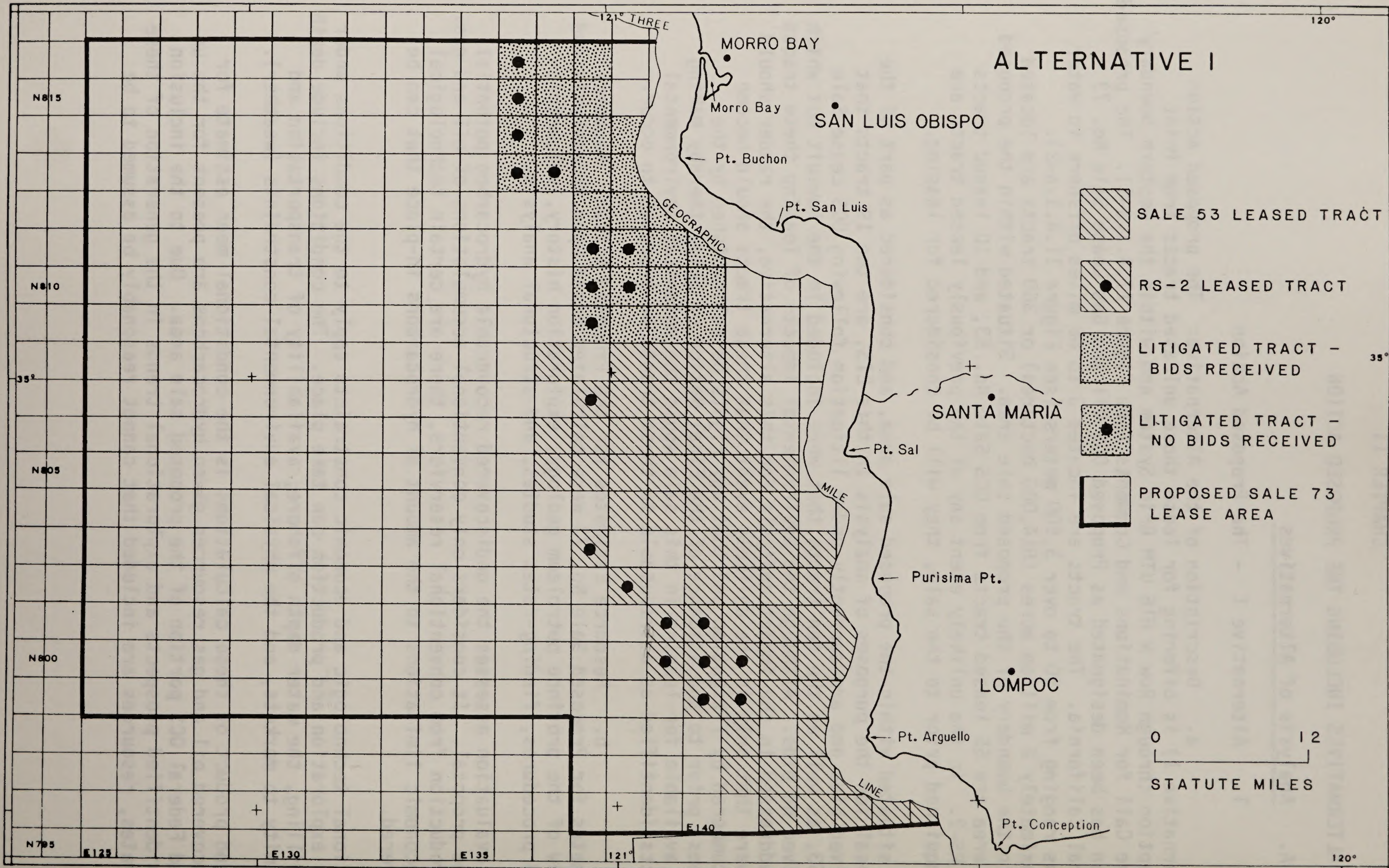

Figure II.A.1.a-1 Proposed Sale No. 73 Lease Area

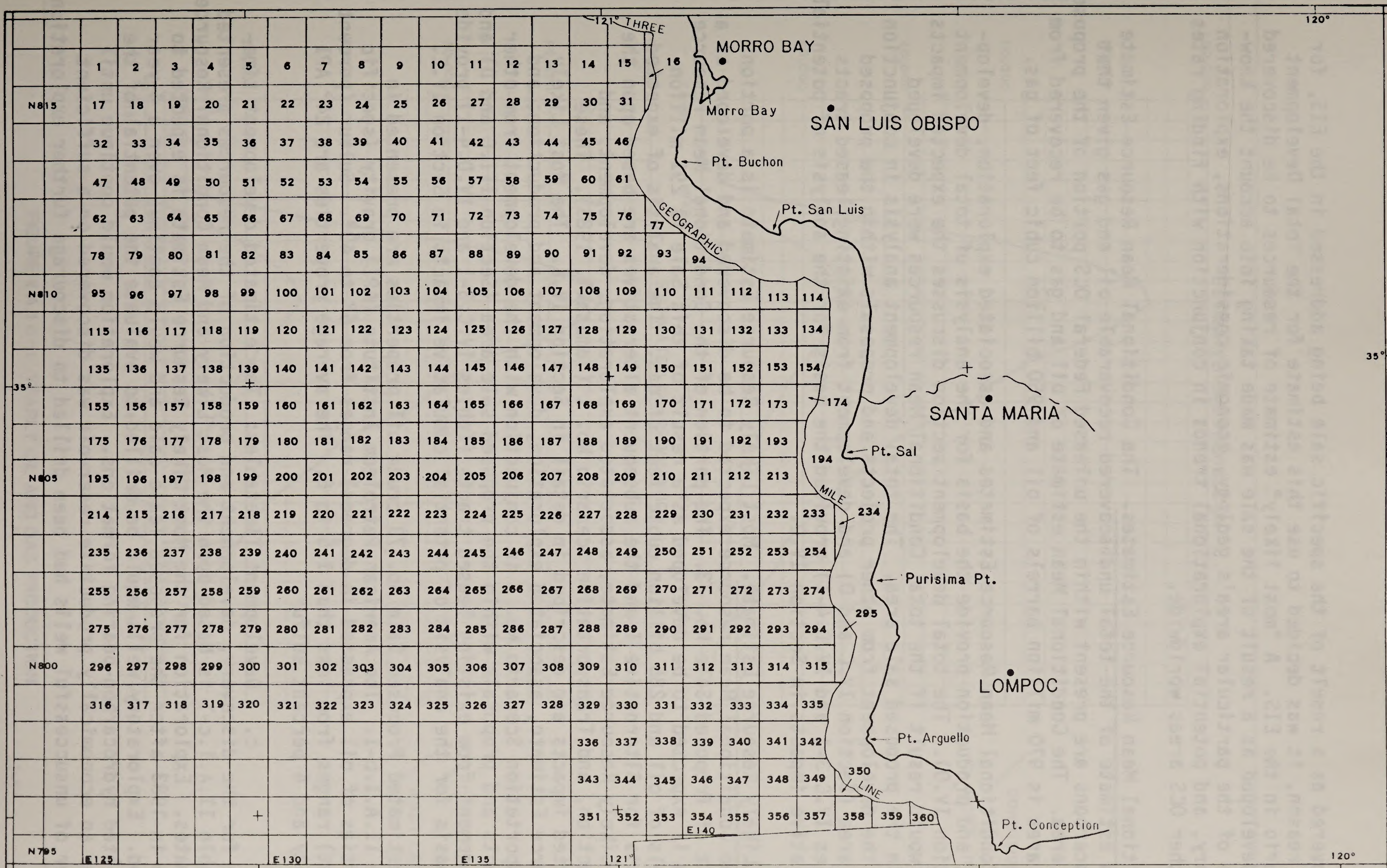

Figure II.A.I.a-2 Proposed Sale No. 73 Tract Location discovered as a result of the specific sale being addressed in the EIS, for this reason, it was decided to use this estimate for the Total Development scenario in the EIS. A "most likely" estimate of resources to be discovered and developed as a result of the sale was made taking into account the knowledge of the particular area's geology, economic considerations, exploration history, and potential explorational trends in conjunction with finding rates in other OCS areas worldwide.

Conditional Mean Resource Estimates. The Conditional Mean Resource Estimate is an estimate of the total undiscovered recoverable oil and gas given that hydrocarbons are present within the unleased Federal OCS portion of the proposed sale area. The Conditional Mean estimate of oil and gas to be recovered from this area is 970 million barrels of oil and 950 billion cubic feet of gas.

The Conditional Mean Resource Estimates and associated exploration, development, and production provide the basis for the analysis of total development (Section IV.O). The total development section discusses the expected impacts that would result if the total Conditional Mean resources were developed within the proposed sale area. The total development analysis in conjunction with the development from other projects and proposals within the proposed sale area (Section IV.C and D) and development from existing leased tracts (Tables IV.C.3-1 and IV.D.4-1) provided the basis for the analysis of potential cumulative impacts in Section IV.O.

Most Likely Resource Estimate. Most Likely Resource Estimate is a portion of the Conditional Mean resource expected to be discovered and developed as a result of Proposed Sale No. 73. The portion of the Conditional Mean resource which is expected to be developed as a result of this Sale is 291 million barrels of oil and 285 billion cubic feet of gas. The analysis of expected impacts for Alternative I and the subsequent alternatives are based upon the Most Likely Resource Estimate, associated exploration, development, and production, and Transportation Scenario No. 1 (Yamasaki, 1983). These expected impacts are described in detail in Section IV.E. The Most Likely Resource Estimate, associated exploration, development and production; and Transportation Scenario No. 1 in conjunction with the development from other projects and proposals within the proposed sale area (Section III.C and D) and development from existing leased tracts (Tables IV.C.3-1 and IV.D.4-1) provide the basis for the analysis of potential cumulative impacts in Section IV.E.

The estimated Proposed Sale No. 73 crude oil properties are presented in Table II.A.1.b-1. The American Petroleum Institute (API) gravity (specific gravities of oil expressed in degrees) ranges from 6° to 40°. Sulfur (percent weight) ranges from less than 1.5 to 6. The average properties are 24° API gravity and 4 percent sulfur.

c. Development Timetables: The estimated development timetable for the discovery, development and production of the resources presented in Table II.A.1.c-1 is based upon the Most Likely and Mean Conditional Resource Estimates. Exploration for the Most Likely Resource Estimate is expected to begin in 1983 after the proposed lease sale and would continue over a 4-year period. Exploratory wells would be drilled to evaluate the potential of the suspected hydrocarbon-bearing formations. Exploration would continue until either an economically productive reservoir was discovered or a sufficient number of unsuccessful wells had been drilled to discourage further exploration.

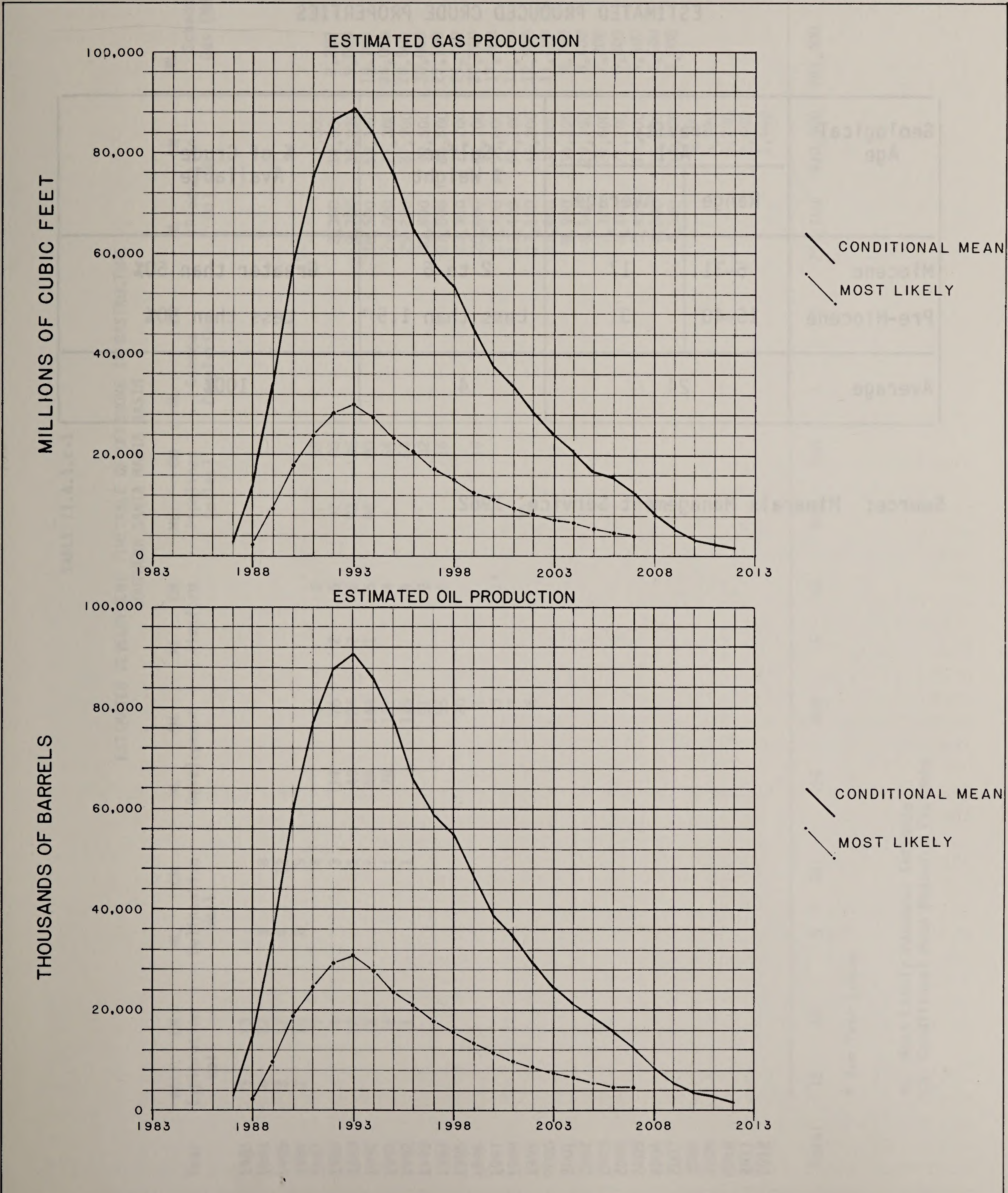

FIGURE II A.1c-1 YEARLY OIL AND GAS PRODUCTION

TABLE II.A.1.b-1

PROPOSED SALE NO. 73
ESTIMATED PRODUCED CRUDE PROPERTIES

Geological Age	Gravity °API		Sulfur % Weight	% of Crude Available
	Range	Average		
Miocene	6-31	17	2 to 6	Greater than 50%
Pre-Miocene	15-40	31	Less than 1.5	Less than 50%
Average	24		4	100%

Source: Minerals Management Service, 1982

TABLE II.A.1.c-1

ESTIMATED DEVELOPMENT TIMETABLE OF OFFSHORE INFRASTRUCTURE
SOUTHERN SANTA MARIA BASIN

Year	Exploration well ML	Exploration well CM	Delineation well ML	Delineation well CM	Development ML	Development CM	Platform ML	Platform CM	Pipelines (miles) ML	Pipelines (miles) CM	Subsea Completion ML	Subsea Completion CM	Production Oil (MB) ML	Production Oil (MB) CM	Schedule Gas (MMCF) ML	Schedule Gas (MMCF) CM
1983	3	13														
1984	4	22	3	8												
1985	3	17	4	12												
1986	2	10	2	9												
1987		7		4		26		2		58				3,000		2,900
1988		4		3	14	76	2	5	92	80			2,300	14,300	2,200	14,000
1989		2		1	49	124	2	6	92	96			9,700	34,900	9,500	34,200
1990		2		1	64	144	1	5	44	80		2	18,500	59,100	18,100	57,900
1991		2		1	28	131		4		64			24,000	77,300	24,000	75,700
1992		1		1		115		4		64			29,200	87,900	28,500	86,200
1993						91		2		32			30,800	90,500	30,000	88,600
1994						55		1		16			27,800	85,600	27,100	83,800
1995						20							23,900	77,200	24,700	75,600
1996						1				16			20,600	65,700	20,200	64,300
1997						5		1*					17,700	58,600	17,400	57,400
1998						7							15,400	54,300	15,100	53,200
1999						5							13,100	46,200	12,900	45,200
2000													11,400	38,400	11,200	37,600
2001													9,900	34,200	9,700	33,500
2002													8,500	29,100	8,400	28,500
2003													7,300	24,600	7,200	24,100
2004													6,400	21,200	6,300	20,800
2005													5,400	18,300	5,300	17,900
2006													4,600	15,800	4,500	15,500
2007													4,000	12,500	4,000	12,200
2008														8,700		8,500
2009														5,400		5,300
2010														3,200		3,100
2011														2,400		2,400
2012														1,600		1,600
Total	12	80	9	40	155	800	5	30	228	506	0	2	291,100	970,000	285,000	950,000

* Ten Year Lease

ML Most Likely Resource Estimate
CM Conditional Mean Resource Estimate

Various types of exploratory drilling rigs (jack-ups, drillships, submersible and semi-submersible rigs) would be used to drill an estimated 12 exploratory wells throughout the entire proposed sale area to evaluate the sale area's potential. Refer to Section II.A.1.d. for a discussion of exploration assumptions.

If commercial quantities of hydrocarbons are located during the exploration period, the development phase for southern Santa Maria Basin is expected to occur from 1988 to 1990 with the installation of five platforms. Oil and gas production would begin in 1988 and end in 2007 (Figure II.A.1.c-1). As many as 155 development wells could be drilled during this period. (Refer to Section II.A.1.d. for a complete discussion of exploration and development assumptions.) The total number of wells, platforms, subsea completions, and miles of pipelines required to discover, develop, and produce the estimated amount of resources are also contained in Table II.A.1.c-1.

d. Projected Transportation and Markets: Resource supply, production, development, and transportation assumptions are based on the Most Likely resource estimates of oil and gas (Table II.A.1.c-1). Proposed Sale No. 73 crude production is expected to be refined in the Los Angeles area, San Francisco Bay area, and the Gulf of Mexico area. A discussion of expected markets is given after the Transportation Scenario description.

The following discussion details what are considered to be feasible oil and gas transportation methods. This discussion summarizes the hypothetical scenario presented in Yamasaki (1983). The scenario is a framework of assumptions and estimates on the amount, timing and general locations for OCS development and production activities and facilities. The hypothetical scenario was developed for the purpose of environmental analysis in this document. The assumptions and estimates that are made in the hypothetical scenario incorporate information from historical trends, industry, Federal, State and local planning jurisdictions, geological information, and present technology. The hypothetical platform sites, pipeline routes, tankering routes, and onshore processing and transportation for the scenario do not in any way constitute or imply a recommendation by MMS for future development and production sites. Indeed, other locations are under consideration by industry and local government.

The resulting implementation of the activities assumed in the hypothetical scenario can only be ascertained after leasing occurs, and exploration, development, and production of the resources commences following Federal, State, and local permit review.

Two transportation scenarios have been developed for this proposal. The first scenario, described in this section, uses a mixed mode of pipelines and tankers for transport of hydrocarbons. The second scenario, described in Section IV.N. of this document, is a 100 percent tankering scenario and is considered less likely and therefore discussed separately. The tankering scenario was developed at the request of the State of California and other agencies.

The hypothetical transportation scenario developed for Proposed Sale No. 73 and used in the environmental analysis of this document assumes five oil and gas platforms are expected to be required to develop 291 million barrels (bbls) of crude oil and 285 cubic feet (TCF) of gas in the proposed sale area (see Table II.A.1.d-1). Two of the hydrocarbon platforms are hypothetically located in the northeastern portion of the proposed sale area and the other three hydrocarbon platforms are hypothetically located in the southern portion. Oil and gas production from the proposed sale area would be transported to shore via subsea pipelines and processed at assumed to be in existence onshore processing facilities.

Oil and gas production from the No. 1 platform (see Table II.A.1.d-1) in the northeastern portion of the proposed sale area would be transported by oil and gas subsea pipelines twelve miles to the No. 2 platform. Production from the No. 1 platform would be commingled with production from the No. 2 platform. The commingled production would be transported 32 miles in subsea pipelines to shore (near the Santa Maria River) where they would tie-in with assumed to be in existence onshore pipelines. These assumed existing pipelines are expected as a result of development and production activities from Federal Lease Sale No. 53. These onshore pipelines would transport the production to an assumed to be in existence oil and gas processing facility which would be located near the Union Oil refinery near Nipomo Mesa. This processing facility is presently being considered by industry and local government to handle production from Sale No. 53 leases. The processed oil and gas would then be transported by assumed to be in existence (again, as a result of Sale 53 activities) oil and gas pipelines that would follow the existing Southern Pacific Railroad Company's right-of-way to Gaviota. (See discussion below for the subsequent storage and distribution of the production).

The three remaining platforms expected from this proposal are hypothetically located in the southern portion of the proposed sale area (Table II.A.1.d.). Oil and gas from the No. 3 platform would be transported by oil and gas subsea pipelines 24 miles to the No. 4 platform. Production from the No. 3 and 4 platforms would be comingled here. The comingled production would be transported 22 miles in subsea pipelines to the No. 5 platform. There, all production would be commingled. The total production from the three platforms would be transported in oil and gas subsea pipelines to shore at a location between Point Conception and Point Arguello. The offshore production would tie-in at this landfall with onshore pipelines which are assumed to be in existence as a result of Sale No. 53 activities. The onshore pipelines would transport hydrocarbon production along the Southern Pacific Railroad Company right-of-way to an assumed to be in existence oil and gas processing facility at Gaviota.

The processed production from the two northern platforms and the untreated production from the three southern platforms would be transported to Gaviota. At the present time, several onshore locations are being considered for a consolidated marine terminal, storage tanks, oil and gas processing facility, and supply base (e.g., Gaviota and Las Flores Canyon). These types of facilities and sites (including alternates) are being considered by industry and local planning jurisdictions (e.g., Santa Barbara County Petroleum Transportation Committee). For the purposes of environmental analysis in this document, these facilities are assumed to be in existence at Gaviota. The Las Flores Canyon site (or other sites) would be equally feasible locations. A current plan of development (Exxon) considers two options for treating crude - an onshore treating facility at Las Flores Canyon and an offshore treating facility. The eventual location and types of facilities will depend on decisions by State and local planning jurisdictions and industry. According to current county and State policy, only one consolidated facility is likely to be approved.

At Gaviota, processed gas would be transported to a nearby, existing 16-inch gas pipeline for distribution to customers. Processed oil would be stored at a distribution tank, then transported from Gaviota as follows: 1) 50 percent of the oil would go to Los Angeles area refineries via onshore pipeline (this pipeline is presently being considered by the Petroleum Transportation Committee (PTC, 1982); 2) 25 percent of the oil would be tankered from the Gaviota marine terminal north to San Francisco Bay area refineries; and 3) the remaining 25 percent of the produced oil would be tankered to the Gulf of Mexico area refineries (Galveston, Texas) via the Panama Canal. A supply boat base at Gaviota is assumed to be constructed and it would be used to service the five platforms in the Santa Maria Basin. In addition, helicopter bases exist near San Luis Obispo (SLO) (SLO Co. Airport), Oceano, Lompoc, and Santa Maria (Santa Maria Airport). A crew boat base at Avila Bay (Port San Luis or an alternate site that is approved by State and local planning jurisdictions) would need to be built to support hydrocarbon operations in this area.

Another alternative is being considered by local planning jurisdictions for transporting oil production from this area: the Getty Oil Company proposal, which would transport production from Gaviota via a new onshore pipeline north to the San Joaquin Valley for distribution to nearby refineries, Los Angeles refineries, or San Francisco Bay area refineries. MMS has chosen the onshore pipeline to Los Angeles for environmental analysis purposes in this document. All alternatives are equally feasible at this time, and the present scenario does not constitute or imply a recommendation by MMS for future development and production sites. The eventual location of the facilities and transportation modes will depend on decisions by State and local planning jurisdictions and industry.

California refineries are assumed (See Section IV.E.3.m and Yamasaki, 1983 for details) to have the capacity and capability to process Proposed Sale No. 73 crude oil by the time it is piped or tankered to them (1988). Twenty-five percent of the production is estimated to be of low quality (heavy and high sulphur) and as such would need to be tankered to the Gulf of Mexico for refining. No new refineries are expected to be built as a result of this proposal. This is based on existing refining capacity and the assumption that Proposed Sale No. 73 production that is refined in California would displace an equal amount of Alaskan North Slope (ANS) crude (see Dames and Moore, 1982; California Energy Commission 1983). It is thought that California offshore crude would be priced such that it would be purchased in preference to ANS crude. If 75% of the proposed crude is refined in California, then about four percent of the current amount (see California Energy Commission, 1983) of ANS crude could be displaced. This would reduce a proportionate amount of Alaskan tanker trips to California.

For the purposes of environmental analysis, MMS has assumed that 25 percent of the proposal crude would be of low quality and would be tankered to the Gulf of Mexico for refining. In the future, California refiners will need to make large investments to modify their refining process in order to process low quality crude oil from past and future onshore and offshore California oil.

The present proposal would partially contribute to the need for the refinery modifications if more than 25 percent of the crude is of low quality and it is shipped to California refineries. In the event that the proper permits

TABLE II.A.1.d-1

PROPOSED LEASE SALE NO. 73 (CENTRAL CALIFORNIA) EXPECTED DEVELOPMENT AND HYPOTHETICAL TRANSPORTATION SCENARIO USED FOR ENVIRONMENTAL ANALYSIS PURPOSES - BASED ON MOST LIKELY RESOURCE ESTIMATES

Hypothetical Platform Locations	Oil and Gas Platforms (Expected Nos.)	Subsea Pipelines (Expected Types, Lengths, and Diameters)	Hypothetical Subsea Pipe-line Tie-Ins	Hypothetical Pipeline Landfalls	Hypothetical Processing Facilities	Hypothetical Oil and Gas Onshore Distribution to Gaviota	Hypothetical Oil Distribution from Gaviota	Comments/Notes
1. Northeastern Portion of Sale No. 73 Area	1	- Oil-12 mi,8 in	- Expected Platform No. 2 (below)	- None	- See No. 2 (below)	- See No. 2 (below)	a	Support vessels for the five expected platforms would originate from Port San Luis (new crew base) and the AE supply base at Gaviota. Heli-copter service would originate from the airports of San Luis Obispo County, Oceano, Santa Maria Public and Lompoc.
		- Gas-12 mi,6 in	- Expected Platform No. 2 (below)	- None	- See No. 2 (below)	- See No. 2 (below)	a	
2. Northeastern Portion of Sale No. 73 Area	1	- Oil-32 mi,10 in	- Expected Platform No. 1 (above)	- Nipomo Mesa	Hydrocarbons transported to AE hydrocarbon pro-cessing facility (Nipomo Mesa) via AE onshore pipelines	- Via AE onshore hydrocarbon pipelines that would follow the existing Southern Pacific Railroad right-of-way	a	
		- Gas-32 mi,10 in	- Expected Platform No. 1 (above)	- Nipomo Mesa				
3. Southern Portion of Sale No. 73 Area	1	- Oil-24 mi,8 in	- Expected Platform No. 4 (below)	- None	- See No. 5 (below)	- See No. 5 (below)	a	
		- Gas-24 mi, 6 in	- Expected Platform No. 4 (below)	- None	- See No. 5 (below)	- See No. 5 (below)	a	
4. Southern Portion of Sale No. 73 Area	1	- Oil-22 mi, 10 in	- Expected Platforms Nos. 3 & 5 (above and below)	- None	- See No. 5 (below)	- See No. 5 (below)	a	
		- Gas-22 mi, 10 in	- Expected Platforms Nos. 3 & 5 (above and below)	- None	- See No. 5 (below)	- See No. 5 (below)	a	
5. Southern Portion of Sale No. 73 Area	1	- Oil-24 mi, 14 in	- Expected Platform No. 4 (above)	- Between Pt. Arguello and Pt. Conception	- AE hydrocarbon processing faci-lity at Gaviota (see next column)	- Via AE onshore hydrocarbon pipelines that would follow the existing Southern Pacific Railroad right-of-way	a	
		- Gas-24 mi, 12 in	- Expected Platform No. 4 (above)	- Between Pt. Arguello and Pt. Conception	- AE hydrocarbon processing faci-lity at Gaviota (see next column)			

AE - Assumed to be existing. For environmental analysis purposes, these structures or facilities are assumed to be existing as a result of the development activities from lease sales (federal and state) prior to the present proposal. As they are currently nonexisting, it is entirely possible that other locations and/or facilities may be used at the actual time of development. The AE facilities at Gaviota are based on the Santa Barbara County Petroleum Transpor-tation Committee (Phase I) Report which indicates several promising locations for hydrocarbon infrastructure. The Las Flores Canyon sites, or other locations, would be equally feasible locations for these facilities.

a - The total processed production from the five expected platforms would be distributed as follows: 50 percent to Los Angeles area refineries via an AE onshore pipeline; 25 percent tankered to San Francisco Bay area refineries from an AE nearshore marine terminal located offshore Gaviota; 25 percent tankered to Gulf of Mexico area refineries from the AE nearshore marine terminal located offshore Gaviota. The total processed gas production from the five expected platforms would be transported to the nearby existing Southern California Gas Company's 16 inch gas transmission line.

* - The hypothetical platform locations, subsea pipeline routes, landfalls, tankering routes, and onshore transportation do not constitute or imply a recommendation by MMS for future development and production sites.

for refinery modifications cannot be obtained from State and local governments, or if the modifications prove to be economically infeasible, then more than 25 percent of the proposal crude would need to be tankered to the Gulf Coast for refining (see Section IV.E.3.m for details).

California OCS oil and gas has found, and will likely continue to find, a variety of intermediate and final product uses. The particular use that might result from oil and gas produced in the region depends on institutional and economic relationships that would evolve during the life of the project. Generally, products of California refineries are consumed within the State, though Nevada and Arizona are also logical markets. In addition, there are numerous markets for Proposed Sale No. 73 crude that is refined on the Gulf Coast, for example, the southern and eastern United States.

e. Mitigating Measures that are Part of the Proposed Action: The Secretary of the Interior has been designated by the Outer Continental Shelf Lands Act of 1953 (OCSLA) 43 USC 1331 et seq., as amended, to administer the activities which relate to the leasing, exploration, development, and production of mineral resources of the OCS. The OCSLA and various other laws which provide for the protection and safe use and development of the oceans and its resources are listed in Section I.D. These laws have also been compiled by USGS (1981) in Compilation of Laws Related to Mineral Resource Activities on the Outer Continential Shelf.

The MMS has been delegated the responsibility for managing and monitoring the oil and gas development on the Federal OCS.

In addition to the OCSLA and the various laws, MMS utilizes Federal and State regulations, OCS Orders governing oil and gas lease operations, and Notices to Lessees are utilized by Federal agencies to mitigate environmental impacts or to establish operating standards. These laws, regulations, and orders are considered part of the proposed action (Section IV.B). The mitigating effect of these measures has been considered in the environmental impact analysis.

There are over 49 sets of regulations which have been developed to administer the OCS minerals program. These regulations are specifically designed to assure the protection of the marine, coastal, and human environment. These regulations have been compiled by USGS (1981) in Compilation of Regulations Related to Mineral Resource Activities on the Outer Continental Shelf.

The regulations by which MMS governs the leasing, the granting of pipeline right-of-ways, and the conduct of mineral operations are contained in 30 CFR 250.

Regulations require an exploration plan to be prepared and submitted for approval to MMS before a lessee may begin exploration, or development/production on a lease. An environmental report is also required to be submitted with the initial plans. The environmental report is site specific to provide adequate environmental information and data for review. The regulations recognize that exploration activities, and development and production activities may significantly affect the environment and provide for the evaluation of the effects of those activities. If significant potential impacts adversely affecting the environment are identified, an EIS will be prepared in accordance with Section 102(2)(C) of the National Environment Policy Act.

Upon the approval of the plan and environmental report, the lessee may file an Application for Permit to Drill (APD) or specific applications to conduct activities described in the plan. The activities are approved by MMS after a detailed review of the application and a hazard analysis of the drill site.

Other permits required prior to exploratory drilling include permits for aids to navigation and platform installation from the U.S. Coast Guard (USCG), navigation permits from the U.S. Army Corps of Engineers (COE), and National Pollutant Discharge Elimination System (NPDES) permits from EPA. All of these permits and plans must be reviewed and approved by the affected States relative to consistency with their Coastal Management programs.

Section 21(b) of the OCSLA requires that on all new drilling and production operations, and whenever practicable on existing operations, the use of the best and safest technologies (BAST) which the Secretary determines to be economically feasible. This requirement is applicable on equipment which, if it failed, would have significant effects on safety, health, or the environment.

Section 5(a)(8) of the OCSLA requires the Secretary of the Interior to prescribe regulations with provisions for compliance with the national ambient air quality standards pursuant to the Clean Air Act (42 USC 7401 _et seq._) to the extent that OCS activities significantly affect the air quality of any State. This has been accomplished through 30 CFR 250.57. These regulations are designed to ensure that emissions from OCS facilities do not cause significant effects on the onshore air quality of a State.

It also requires that OCS facilities causing onshore concentrations of pollutants in excess of National Ambient Air Quality Standards be controlled, such that emission levels will not contribute to the nonattainment of any onshore area (see Appendix H).

There are 12 OCS Orders (Order No. 13 is under development) which supplement the regulations governing drilling and production on the OCS. After the leases are issued, MMS supervises the exploration, development, and production operations through periodic compliance inspections to ensure the lessee/operator is complying with the approved operating plans, DOI regulations, OCS Orders, and lease terms. A description of the OCS Orders are contained in Section IV.B.1.

NTL's provide additional clarification, correction, or addition to the regulations and OCS orders in order to aid in mitigating environmental impacts. These notices provide information on the requirements necessary prior to the approval of exploratory/development/production operations (see Section IV.B.6).

Compliance inspections are conducted on the OCS activities throughout the entire project to assure that all operations comply with the safety and pollution-prevention requirements. Enforcement actions for noncompliance include written warnings or shut-ins of platforms, zone (wells), equipment or pipelines.

Regulations contained in 30 CFR 250 govern the environmental, operational, and abandonment requirements for right-of-way (R/W) grants. Best available and safest technology generally must be utilized. Potential effects of a proposed pipeline on human, marine, and coastal environments, life, property, and mineral resources must be considered prior to granting of a R/W. These concerns are addressed in environmental documents prepared by the R/W applicant and/or MMS. Special stipulations may be attached to the R/W to protect these values.

The OCSLA establishes in the U.S. Treasury an Offshore Oil Pollution Compensation Fund and a Fishermen's Contingency Fund. The Oil Pollution Compensation Fund provides compensation for any person suffering direct or actual injury caused by the discharge of oil from an offshore facility or vessel. The Fishermen's Contingency Fund is to compensate U.S. commercial fishermen for damages caused by the exploration, development, and production of oil and gas when no financially responsible party can be found (see Section IV.B.7 and 9).

Additional mitigating measures (Oil Spill Cleanup and Containment, Ground Water Protection, Aircraft Restrictions, Fishing Vessel and Gear Damage Compensation Fund) which are considered part of the Proposed Action are discussed in Chapter IV.B.

f. Potential Mitigating Measures: The following measures are proposed to reduce or eliminate adverse impacts identified in Section IV as a result of the proposed action and subsequent alternatives. A secretarial decision on these mitigating measures has not occurred; they are noted here as potential measures which could further mitigate impacts resulting from this Proposed Lease Sale No. 73. Some of these measures have been imposed by the Secretary in past lease sales. If any of these measures are adopted, they will appear in the Final Sale Notice. The impact analysis in this environmental impact statement does not assume that the following measures are in place.

<u>Stipulations.</u>

i. Biological Stipulation: This stipulation provides protection for all biological resources. However, of particular concern are impacts to biological habitats associated with hard bottom areas (rocky areas). The biological stipulation can be invoked for soft bottom communities or other biological resources if there is reason to believe a biological resource that needs protection exists. Impacts to rocky areas can result from exploration and development platforms, and drilling muds and cuttings.

Production platforms could alter benthic assemblages on hard bottoms for a horizontal radius of 100 meters. The alteration of the assemblage is caused by organisms falling from the platform structure and creating a different bottom surface and community (Wolfson et al., 1979).

The highest impacts from drilling muds and cuttings on will be in those areas where the currents are weak. The highest concentration of muds and cuttings will primarily accumulate and settle on the drill site. Where the cuttings and muds accumulate most organisms will be buried, and the composition of the bottom will become altered within a radius of 10 to 100 meters around the platform or rig. Due to the alteration of the bottom substrate from the discharge of muds, cuttings, and associated impacts from the platform, re-colonization will consist of species different from the original inhabitants. If platforms are not concentrated on rocky areas, the resulting impacts are expected to be moderate to high on the communities around the platform. Additionally, low impacts as far as 800 to 1000 meters are possible from drilling muds. (See Appendix A for definitions of impact levels.) If platforms are concentrated on hard bottom reefs, the ecology of the entire rocky area could be altered resulting in a high impact.

All leases resulting from this lease sale would have the biological stipulation attached. It is planned to invoke the biological stipulation, as necessary, on tracts having rocky areas shown on Graphic No. 2 for the production phase of development.

This stipulation may be invoked for the production phase if hazard surveys or other means show the hard bottom structure to be significant. The biological stipulation would be invoked for the exploration phase of development if hazard surveys show rocky areas that cannot be avoided by drilling 1000 meters from the outcrop.

Biological Stipulation

(a) If the Regional Manager (RM) has reason to believe that biological populations or habitats exist and require protection, he shall give the lessee notice that the lessor is invoking the provisions of this stipulation and the lessee shall comply with the following requirements. Prior to any drilling activity or the construction or placement of any structure for exploration or development on lease areas including, but not limited to, well drilling and pipeline and platform placement, hereinafter referred to as "operation," the lessee shall conduct site specific surveys as approved by the RM and in accordance with prescribed biological survey requirements to determine the existence of any special biological resource including, but not limited to:

(1) Very unusual, rare, or uncommon ecosystems or ecotones

(2) A species of limited regional distribution that may be adversely affected by any lease operations

If the results of such surveys suggest the existence of a special biological resource that may be adversely affected by any lease operation, the lessee shall: 1) relocate the site of such operation so as not to adversely affect the resources identified; 2) establish to the satisfaction of the RM on the basis of the site specific survey, either that such operation will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist. The RM will review all data submitted and determine, in writing, whether a special biological resource exists and whether it may be significantly affected by lessee's operations. The lessee may take no action until the RM has given lessee written directions on how to proceed.

(b) The lessee agrees that if any area of biological significance should be discovered during the conduct of any operations on the leased area, the lessee shall report immediately such findings to the RM and make every reasonable effort to preserve and protect the biological resource from damage until the RM has given the lessee directions with respect to its protection.

Evaluation of Effectiveness. The biological stipulation allows leasing activities to occur while providing protection to biological habitats. This stipulation was developed in consultation with the Fish and Wildlife Service, and requires that the lessees conduct environmental surveys when the RM believes them to be necessary.

Requiring site surveys provides for identification of specific areas which must be avoided prior to the installation of equipment and facilities. By imposing the biological stipulation, the unique organisms and habitats in these areas are adequately protected, while allowing the lessee to locate uninhabited areas for the placement of drilling structures which are compatible to the area. Therefore, the potential adverse impacts identified during the pre-lease process for this issue are believed to be adequately mitigated.

Through this stipulation the RM may require other mitigating measures for benthic communities that may include: 1) barging drilling fluids and muds away from the drill site, 2) shunting fluids and muds, 3) avoidance a of the area of concern, and 4) monitoring during drilling operations to observe any changes.

Barging would be an effective method of eliminating impacts from drilling fluids and muds. Although it is an effective method, a few problems are associated with barging. It is difficult and requires time to obtain dumping permits for the fluids and muds. Large volumes of fluids and muds from production platforms would be expensive and difficult to move. Barging of the muds would not prevent the buildup of a new community on the seafloor from organisms attached to the platform.

Shunting would be an effective method provided calculations are correct for the drilling fluids to avoid the benthic area of concern. Avoidance was mentioned above, and based upon present knowledge of drilling impacts, avoidance by 1000 m would mitigate any impacts which might occur during drilling operation. If information from the monitoring show adverse impacts to the communities present, other operating procedures, such as barging or shunting, can be initiated.

ii. Cultural Resource Stipulation

(To apply to all leases resulting from this lease sale.)

(a) "Cultural resource" means any site, structure, or object of historic or prehistoric archeological significance. "Operations" means any drilling, mining, or construction or placement of any structure for exploration, development, or production of the lease.

(b) If the Regional Manager (RM) believes a cultural resource may exist in the lease area, the RM will notify the lessee in writing. The lessee shall then comply with subparagraphs (1) through (3).

(1) Prior to commencing any operations, the lessee shall prepare a report, as specified by the RM, to determine the potential existence of any cultural resource that may be affected by operations. The report, prepared by an archeologist and geophysicist, shall be based on an assessment of data from remote-sensing surveys and of other pertinent cultural and environmental information. The lessee shall submit this report to the RM for review.

(2) If the evidence suggests that a cultural resource may be present, the lessee shall either:

(i) Locate the site of any operations so as not to adversely affect the area where the cultural resource may be; or

(ii) Establish to the satisfaction of the RM that a cultural resource does not exist or will not be adversely affected by operations. This shall be done by further archeological investigation, conducted by an archeologist and a geophysicist, using survey equipment and techniques deemed necessary by the RM. A report on the investigation shall be submitted to the RM for review.

(3) If the RM determines that a cultural resource is likely to be present on the lease and may be adversely affected by operations, he will notify the lessee immediately. The lessee shall take no action that may adversely affect the cultural resource until the RM has told the lessee how to protect it.

(c) If the lessee discovers any cultural resource while conducting operations on the lease area, the lessee shall report the discovery immediately to the RM. The lessee shall make every reasonable effort to preserve the cultural resource until the RM has told the lessee how to protect it.

Evaluation of Effectiveness. MMS has evaluated the potential for cultural resources in the Central California OCS area. Proposed Sale No. 73 encompasses approximately 2 million acres of seabed with a large portion of the area in very deep waters.

The vast area and depths involved make any archaeological search very difficult. For these reasons archaeological investigation on the Pacific OCS is confined to the most sensitive area, i.e., water less than or equal to 120 meters deep, or in areas of potentially high shipwreck density, as determined by review of historical data.

The primary method for cultural resource investigation is remote sensing (magnetometer, sidescan sonar, subbottom profiler). On leases which are considered to be in the more sensitive area, MMS may invoke the Cultural Resources Stipulation which requires a cultural resources survey be conducted in conjunction with the usual geohazards remote sensing survey. A cultural resource survey is not required, however, when existing data are sufficient to prepare a report on cultural resources on a lease where the stipulation is involved. The methods by which this stipulation is implemented are specified by a periodically updated Notice to Lessees (NTL). NTL 77-3 is currently in effect.

Very few areas exist on the central California OCS which are believed to have been inhabited by prehistoric man. Of those that were analyzed for possible habitation, none exhibit evidence that potential prehistoric sites could still survive (MMS, 1982a).

Numerous shipwrecks are known to have occurred along the coast in historic times. All of these sites have a potential for impact from bottom disturbing activities. These activities could cause the site to suffer either irreversible and irretrievable loss of the information which could be obtained or complete destruction. The methodologies used in the survey are estimated to be 90 percent effective (MMS, 1982b) in detecting all the cultural resources in the area.

Although a very low impact is anticipated to cultural resources in the sale area, a high impact could occur on a case by case basis for individual sites. Utilizing the survey, these potential impacts to individual sites will be greatly reduced or eliminated.

Based upon water depth and known cultural resource location data, the following tracts are expected to be recommended for invocation of the Cultural Resources Stipulation in regard to shipwrecks:

15, 16, 31, 94, 112, 113, 114, 174, 193, 194, 213, 233, 315, 349, 358, 359, 360

Tracts 254, 274, 295, 335, and 350 have undergone cultural resource surveys for shipwrecks in the past and the stipulation will be invoked on the these tracts if new information indicates a potential for previously undiscovered cultural resource.

If potential cultural resources are identified as a result of the remote sensing survey, MMS will require the operator: 1) avoid the object(s), or 2) identify the object(s) through additional investigation (e.g., remote camera, diving archaeologists) as something other than a cultural resource. Based on past experience with cultural resources in this area, MMS expects in most cases the lessee will choose the former alternative, avoidance. Protection of cultural resources by avoidance is considered an appropriate form of mitigation. In addition, the lessee or agent, during any activities on the leasehold, is required to report any cultural resource finding to the RM. The lessee is also required to make every reasonable effort to preserve and protect such cultural resource from damage until the RM makes a determination on its preservation. Through the imposition of this stipulation and compliance with applicable Federal and State laws regarding cultural resources, it is believed potential impacts to cultural resources are adequately mitigated.

iii. Military Stipulation No. 1

(This stipulation will apply to tracts determined through consultation with the Department of Defense which conflicts with military operating areas.)

(a) The lessee agrees that prior to operating or causing to be operated on its behalf boat or aircraft traffic into individual, designated warning areas, the lessee shall coordinate and comply with instructions from the Commander, Western Space and Missile Center (WSMC), the Commander, Pacific Missile Test Center (PMTC), and Commander, Fleet Area Control and Surveillance Facility (FACSFAC), or other appropriate military agency. Such coordination and instruction will provide for positive control of boats and aircraft operating in warning areas at all times.

(b) The lessee, recognizing that mineral exploration and exploitation and recovery operations of the leased areas of submerged lands can impede tactical military operations, hereby recognizes and agrees that the United States reserves and has the right to temporarily suspend operations of the lessee under this lease in the interests of national security requirements. Such temporary suspension of operations, including the evacuation of personnel, and appropriate sheltering of personnel not evacuated (an appropriate shelter shall mean the protection of all lessee personnel for the entire duration of any Department of Defense activity from flying or falling objects or substances), will come into effect upon the order of the Regional Manager (RM) after consultation with the Commander, Western Space and Missile Center (WSMC), the Commander, Pacific Missile Test Center (PMTC), and the Commander, Fleet Area Control and Surveillance Facility (FACSFAC), or other appropriate military agency, or higher authority, when national security interests necessitate such action. It is understood that any temporary suspension of operations for national security may not exceed 72 hours; however, any such suspension may be extended by order of the RM. During such periods equipment may remain in place.

(c) The lessee agrees to control his own electromagnetic emissions and those of his agents, employees, invitees, independent contractors or subcontractors emanating from individual, designated defense warning areas in accordance with requirements specified by the Commander, Western Space and Missile Center (WSMC), the Commander, Pacific Missile Test Center (PMTC), and the Commander, Fleet Area Control Surveillance Facility (FACSFAC), or other appropriate military agency, to the degree necessary to prevent damage to, or unacceptable interference with, Department of Defense flight, testing or operations activities conducted within individual, designated warning areas. Necessary monitoring, control, and coordination with the lessee, his agents, employees, invitees, independent contractors or subcontractors, will be affected by the Commander of the appropriate onshore military installation conducting operations in the particular warning area: provided, however, that control of such electromagnetic emissions shall permit at least one continuous channel of communication between a lessee, its agents, employees, invitees, independent contractors or subcontractors, and onshore facilities.

iv. Military Stipulation No. 2.

This stipulation indemnifies and saves harmless the United States against all claims for loss, damage, or injury sustained by the lessee. (This stipulation will apply to tracts determined through consultation with the Department of Defense which conflicts with military operating areas.)

Whether or not compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occurs in, on, or above the Outer Continental Shelf, to any person or persons or to any property of any person or persons who are agents, employees or invitees of the lessee, its agents, independent contractors or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the Outer Continental Shelf, if such injury or damage to such person or property occurs by reason of the activities of any agency of the U.S. Government, its contractors, or subcontractors, or any of their officers, agents or employees, being conducted as a part of, or in connection with, the programs and activities of the Western Space and Missile Center (WSMC), the Pacific Missile Test Center (PMTC), or other appropriate military agency.

Notwithstanding any limitations of the lessee's liability in Section 14 of the lease, the lessee assumes the risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the United States, its contractors or subcontractors, or any of their officers, agents, or employees. The lessee further agrees to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by the lessee, and to indemnify and save harmless the United States against all claims for loss, damage, or injury sustained by agents, employees, or invitees of the lessee, its agents or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installations and agencies, whether the same be caused in whole or in part by the negligence or fault of the United States, its contractors, or subcontractors, or any of their officers, agents, or employees and whether such claims might be sustained under theories of strict or absolute liability or otherwise.

Evaluation of Effectiveness. The two military stipulations were developed in consultation with the Department of Defense. These stipulations relating to electromagnetic interference, shelter/evacuation, and holding harmless may be included in Proposed Sale No. 73 leases as they have been in previous OCS sales. Although these stipulations do not eliminate all impacts to the military, they are considered to adequately mitigate any potential Department of Defense conflicts in tracts to which they are applied. With the selection of the military stipulation the impacts to military activities would be reduced from high to low. Even though space-use conflicts from structure placement and vessel traffic would still exist, it would be reduced through the mechanism and procedure for coordination now being officially mandated.

v. Transportation of Hydrocarbon Products Stipulation

(To apply to all leases resulting from this lease sale.)

(a) Pipelines will be required: (1) if pipeline rights-of-way can be determined and obtained; (2) if laying of such pipelines is technologically feasible and environmentally preferable; and (3) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to any recommendation of the intergovernmental planning program for assessment and management of transportation of Outer Continental Shelf oil and gas with the participation of Federal, State, and local governments and the industry.

(b) Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the Regional Manager.

(c) Where the three criteria set forth in the first sentence of this stipulation are not met and surface transportation must be employed, all vessels used for carrying hydrocarbons to shore from the leased area will conform with all standards established for such vessels, pursuant to the Port and Tanker Safety Act of 1978 (PL 95-474).

Evaluation of Effectiveness. The intent of this measure is to transport hydrocarbons by the safest and environmentally preferable method. This stipulation requires, when feasible, pipelines to be used instead of tankers to transport oil. The use of pipelines would reduce air quality impacts from the transportation of hydrocarbon products and trade off the marginally higher oil spill rate of pipelines versus the lower tanker spill rate (1.6 to 1.3 spills per billion barrels of oil transported).

vi. Wells and Pipeline Stipulation

(To apply to all leases resulting from this lease sale.)

(a) Wells. Subsea wellheads and temporary abandonments, or suspended operations that leave protrusions above the sea floor, shall be protected, if feasible, in such a manner as to allow commercial trawl gear to pass over the structure without snagging or otherwise damaging the structure or the fishing gear. Latitude and longitude coordinates of these structures, along with water depths, shall be submitted to the Regional Supervisor Field Operations. The coordinates of such structures will be determined by the lessee utilizing state-of-the-art navigation systems with the accuracy of at least ±50 feet (15.25 meters) at 200 miles (322 kilometers).

(b) Pipelines. All pipelines, unless buried, including gathering lines, shall have a smooth-surface design. In the event that an irregular pipe surface is unavoidable due to the need of valves, anodes or other structures, those irregular surfaces shall be protected in such a manner as to allow trawl gear to pass over the object without snagging or otherwise damaging the structure or the fishing gear.

Evaluation of Effectiveness. Existing MMS regulations require that subsea objects be marked by aids to navigation as directed by the U.S. Coast Guard unless: 1) they are submerged in water depths greater than 305 m (1,000 feet), 2) they weigh 18 kilograms (40 pounds) or less and are of such shape or configuration that they are unlikely to snag or damage fishing devices, or 3) they are less than 46 m (150 feet) from fixed structures on which approved aids to navigation are maintained. Therefore, subsea wellheads (wells connected by pipelines to a platform or that are part of a subsea completion system), temporary abandonments (temporarily abandoned subsea wellheads) and similar subsea objects usually are required to be marked by a suitable aid to navigation. Although this helps fishermen to avoid these structures, there still is a significant potential for fishing nets to become entangled on these structures, particularly if these structures are placed in important trawl grounds. This potential for conflict could cause economic losses to the commercial fishing industry through net damage and loss or through preclusion of fishing. This stipulation would require that subsea wellheads and temporary abandonments be protected, if feasible, so commercial trawl gear can pass over these structures. Thus, fishermen would not be precluded from fishing in areas where these wells are located and would not sustain net damage and loss. The cumulative impact of these structures is expected to result in significant economic losses to fishermen. Adoption of this stipulation would nearly eliminate economic losses to fishermen caused by these structures.

Existing regulations require that pipelines be compatible with commercial fishing gear. This means that fishermen must be able to fish over the pipeline without damaging the fishing net or the pipeline. This stipulation provides details on how this compatibility needs to be accomplished when pipelines are not buried. Pipelines need to have a smooth-surface design, but if an irregular pipe surface is unavoidable, the irregular surfaces need to be protected so trawl gear can pass over the object without snagging or otherwise damaging the structure or the fishing gear. This stipulation will provide valuable information on how pipeline and fishing compatibility can be achieved.

vii. Fisheries and Wildlife Training Program Stipulation

(To apply to all leases resulting from this lease sale.)

The lessee shall include in his exploration and development plans, submitted under 30 CFR 250.34, a proposed fisheries and wildlife training program for review and approval by the Regional Manager. The training program shall be for all personnel involved in exploration, development and production operations, and for platform and shorebased supervisors. The purpose of the training program shall be to familiarize persons working on the project of the value of the commercial fishing industry, the methods of offshore fishing operations, the potential conflicts between fishing operations and offshore oil and gas activities, the locations of marine mammal and bird rookery sites in the area, the seasonal abundance and sensitivities of these animals to disturbance, and the federal laws that have been established to protect endangered and threatened species from harassment and injury. The program shall be formulated and implemented by qualified instructors.

Evaluation of Effectiveness. Commercial fisheries, marine mammals, and birds are expected to sustain losses from the proposal. These losses will be from oil spills, manmade structures, vessels and noise. In the past, many conflicts have occurred because oil and gas personnel were not familiar with the commercial fishing activities and wildlife resources of this area. Through education, oil and gas personnel will know the value of these resources in this area, what activities might affect these resources, and what they can do to prevent conflicts. Thus, a significant reduction in impacts to commercial fisheries, marine mammals, and birds is expected from adoption of this stipulation.

viii. Hazardous Waste Dump Stipulation

Hazardous waste may have been dumped on tracts proposed for this lease sale. These may include low level radioactive waste consisting of tools, gloves, transport containers, and other contaminated articles, but they may also include munitions and other chemical hazards. The radioactively contaminated materials, that may have been dumped at an ocean site, were usually placed in 200-liter (55-gallon) drums, with these drums then imbedded in concrete. The wastes were dumped into the ocean at designated sites which may include the area of this lease. The integrity of these containers is not always assured as they have been known to rupture under pressure (Lipschutz, 1980 and Brown 1971). The other materials usually were also contained in drums or scuttled ships. For further information the reader should see Chapter IV.E., Impact on Ocean Dumping.

This stipulation is suggested to be attached to on the following tracts coinciding with the hazardous waste dump sites 141-143, 156-164, 175-183, 195-203, 214-221, 235-242, 255-261, 275-280, 296-301, and 316-320.

> Prior to any drilling activity or the construction or placement of any structure for exploration or development on the lease, including but not limited to well drilling and pipeline and platform placement, hereinafter in this stipulation referred to as "operation," the lessee shall investigate the potential existence of any radioactive waste, munitions, or toxic chemical waste on the lease. This investigation shall consist of examination of data acquired in the course of the shallow geologic hazard survey as conducted in accordance with the current Notice to Lessees issued by the Regional Manager and examination of the dump site records. This survey shall be over an acceptable grid and shall employ a magnetometer, water depth recorder, and dual side scan sonar or other equipment as determined necessary by the Regional Manager. If the results of the survey indicate the presence of such dumped materials, further investigation as to their nature may be required. A report of this investigation shall be included in the shallow geologic hazards survey report.
>
> If the presence of dumped material is established, the lessee shall: (1) locate the site of the operation so as not to disturb the material, (2) conduct the operation in a manner that minimally disturbs the ocean floor (e.g., dynamically positioned drilling vessel), or (3) establish to the satisfaction of the Regional Manager, on the basis of further investigation that disturbance of the material would not result in any adverse effects on the human or marine environments.

Evaluation of Effectiveness. This stipulation is designed to maintain the integrity of a dump site(s) which may contain toxic waste, obsolete munitions and low level radioactive waste. Application of this stipulation to the appropriate tracts would result in reducing the anticipated very high impacts associated with bottom disturbing activities to specific dump site locations from the proposal to very low.

Information to Lessees.

ix. Navigation Safety ITL:

This ITL serves as a warning to lessees that the USCG has proposed the establishment of Vessel Safety Fairways, Precautionary Area, and Vessel Traffic Separation Scheme in the sale area and may prohibit surface occupancy in these areas, or in any area in which a hazard to vessel traffic may occur. The following tracts are wholly or partially in the proposed vessel control designated areas: wholly; 3-4, 20, 36, 51, 66-67, 83, 100-101, 121, 141-142, 182-183, 222-223, 264-265, 285-286, 306-307, 327-328, 343, and 351 and partially; 2, 5, 19, 21, 34, 35, 37, 50, 52, 65, 68, 82, 84, 99, 102, 122, 40, 143, 61-163, 181, 184, 202, 204, 221, 224, 243, 245, 246, 263, 266, 284, 287, 305, 308, 326, 329, 336, 343, 344, and 353.

Surface occupancy or other activities which would, in the opinion of the USCG, create a hazard to vessel traffic will be prohibited. Such areas include, but are not limited to, Vessel Safety Fairways, precautionary areas, or vessel traffic separation scheme established by the USCG pursuant to the Ports and Waterways Act (33 USC 1223 et seq.). These types of routing measures exist and additional ones are presently being considered within the Proposed Offering area. The tracts described below correspond to the proposed vessel routing measures of the USCG.

x. Overflight ITL:

An ITL designed to inform the potential bidders that in order to reduce aircraft disturbance to seabird colonies, marine mammal rookeries and migrating gray whales, a safety zone should be maintained, where consistent with aircraft safety. Federal and state laws protect these areas from undue harrassment and will be implemented by the appropriate Federal and/or State agency. These agencies include U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), National Park Service (NPS), California Fish and Game, and the Federal Aviation Administration (FAA).

To reduce impacts of aircraft disturbances at seabird colonies, marine mammal rookeries and to migrating gray whales, aircraft should operate, consistent with aircraft safety, at distances from the coastline and at altitudes for specific areas as identified by the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the California Fish and Game Department. The lessee is advised that all violations may be reported to the above agencies, as appropriate, for disposition.

g. Summary of Impacts: The information provided below is a summary of the impacts for Alternative I (the Proposed Action). The analysis of expected impacts were based upon the Most Likely Resource Estimates, associated Exploration, Development and Production of the resources, and Transportation Scenario No. 1 (Yamasaki, 1983). All applicable laws, regulations and Pacific OCS orders (see Section I.D. and E and Section IV.B) were considered in place during the analysis. A detailed discussion of the expected impacts is presented in Section IV.E. In the analysis, oil spills were assumed expected when the Oil Spill Analysis Model predicted a 25 percent probability or greater of one or more spills occurring and contacting land segments or targets. The actual environmental risk may prove higher or lower due to the extremely difficult nature or predicting oil spills and their movements, and the many parameters called for by the model. Therefore, potential impacts as a result of an oil spill are also presented in Section IV.E. Definitions of impact levels are further discussed and tabulated in Appendix A.

i. Physical Environment:

Water Quality. Water quality in the immediate vicinity of oil exploration and development activities would be degraded. The degree of impact (degradation) to water quality would be very low to low (see definitions of impact levels in Appendix A) from routine discharge. Impacts to water quality are expected to be moderate in the southern Santa Maria Basin from the one expected oil spill. The short-term effects of OCS activities in the marine environment, xcept immediately around platforms, should not result in any greater than very low levels of change in water quality parameters (trace metals, hydrocarbons, salinity, temperature, turbidity, pH, etc.).

Ocean Dumping. The impacts from hazardous dump sites could be very high if bottom disturbing activities, in the hazardous waste dump site areas, contact the waste containers.

Air Quality. Proposed Sale No. 73 would cause a small increase in concentrations of inert pollutants (NO_x, SO_2, CO and TSP). There would be a potential of a small increase in O_3 concentrations of in excess of of the State standard for O_3, and could result in maximum O_3 levels close to the federal standards. Air quality impacts would be low to moderate (see definitions in Appendix A).

ii. Biological Environment

Intertidal Benthos. Impacts to intertidal areas would not be expected to occur due to the proposed action. However, if a large oil spill occurred and contacted a sensitive rocky intertidal area impacts could be moderate to high for the oiled intertidal area.

Subtidal Benthos. Impacts to the subtidal benthos are expected to be low from oil and gas production activities due to the proposed action. However, high impacts are possible from drilling on rocky outcrops within the proposed sale area. If a large spill occurred and contacted a rocky outcrop community, high impacts would be possible.

Fish Resources. The proposal is expected to result in very low impacts to fish resources (sublethal and lethal changes insignificant).

Marine Mammals. Impacts to the northern fur seal are expected to be high (high mortality to the California population requiring 1-2 decades for recovery) if the one spill estimated to occur and contact (26% chance of oil spill contact within 30 days) the marine sanctuary waters around the northern Channel Islands occurs during the pupping or breeding season. Impacts to all other species-seals, sea lions, porpoises, and dolphins are expected to be low.

Seabirds. Impacts to the California seabird population are expected to be low to moderate (mortality of the California population of a species requiring 5-10 years for recovery) due to an oil spill expected (26% chance within 30 days) to contact the buffer zone around the northern Channel Islands. Impacts to seabirds in other areas of the state are expected to be low (recovery requiring 1 to 2 years).

Endangered and Threatened Species. Impacts to endangered or threatened brown pelicans, sea otters and gray whales are expected to be low (some mortality requiring less than 2 years for recovery). Impacts to other species should be very low.

Estuaries and Wetlands. Impacts to estuaries and wetlands are not expected to occur due to the proposed action as the highest probability of oil spill occurrence and contact to any individual land segment in Central California within 30 days is 7%. However, if a large oil spill occurred and entered an estuary, impacts could be high to very high.

Areas of Special Concern. Impacts to the areas of special concern in Central California are not expected to occur as the probabilities of one or more spills occurring and contacting any land segments in Central California ranged from less than 0.5% to 7% wiithin 30 days due to the proposed action. However, if a large spill occurred and contacted an area of special concern impacts to sensitive intertidal areas could be moderate to high.

Marine Sanctuaries. Impacts to the Point Reyes/Farallon Islands Marine Sanctuary and Point Reyes Wilderness Area/National Seashore are not expected to occur due to the proposed action. However, if a large oil spill reaches the marine sanctuary, moderate to high local and regional impacts may occur to several seabirds species. If an oil spill occurs and contacts the Drakes-Limantour Estero within Point Reyes Wilderness Area it may experience high impacts if the oil spill covers a significant portion of the estuary and remains for several tidal cycles. The Channel Islands National Marine Sanctuary is expected to experience impacts from an oil spill as a 26% probability of one or more spills occurring and contacting the waters of the Sanctuary within 30 days is predicted, as a result of the Proposal. Northern fur seals are expected to experience high impacts if the spill occurs during pupping or breeding season (June, July, August and the first half of September). If the large oil spill reaches brown pelican feeding grounds, impacts to the brown pelican may be high.

iii. Socioeconomic Environment

Coastal Economy. OCS activity from Proposed Sale No. 73 would have an insignificant stimulating effect on employment and the regional economy. Total employment impacts from Alternative 1 are expected to be very low (an increase of 1 to 3 percent over the base). Changes in earnings for the sale area would be very low (an increase of less than 1 percent over the base).

Demography. The increase in the study area population is expected to be 0.31 percent of the population base in the peak year (1990). The permanent increase in population as a result of this alternative is expected to be 0.16 percent of the 1990 population. Increases in population of the magnitude expected are considered to be very low.

Public Services and Facilities. Overall, the impacts to public services and facilities would be moderate, i.e. short-term stress of local systems that may be accommodated through time and with small use adjustments. Expected impacts to water supply systems would be high for the proposed sale area (significant short-term and some long-term impacts requiring modification of existing systems or construction of new facilities). Impacts on wastewater treatment facilities would be low for the proposed sale area, i.e. some localized stress. Impacts to transportation systems (road) would be low in the sale area (minor short-term stress on local systems with moderate localized impacts at Avila Beach. Impacts to the electrical power supply and air and rail transportations would be very low, or no significant impact.

Coastal Land Use. Impacts to Coastal Land Use in the proposed sale area will be low (low incompatibitiy with existing land uses), with localized moderate impacts at Port San Luis. Localized high impacts, due to incompatability with existing uses may occur if a crew base is sited elsewhere in the proposed sale area. Impacts to housing availability in the proposed sale area will be very low, less than 1 percent increase in the need for housing form OCS related population growth when compared to expected general population growth.

Commercial Fisheries. The proposal is expected to result in moderate (10-20 percent economic loss to trawl fishermen in the proposed sale area for at least three years, and low (less than 10 percent) economic losses to trawl and non-trawl fishermen primarily during years of peak activity. No effect on secondary employment (fish processing plants, etc.) is expected. Overall, the expected regional impacts to commercial fisheries are low (less than a 10 percent economic loss to the industry.

Sportfishing. As a result of the proposal, the impact to sportfishing is expected to be low (a temporary economic loss to a few party boat captains). Most recreational fishing activity is expected to continue throughout the Santa Maria Basin even in the event of an oil spill.

Recreation. The proposed action is expected to have a low to very low impact on the recreational use and enjoyment of the beaches, parks and nearshore waters of the Central California Coast. The aesthetic quality of some water dependent and water enhanced recreational activities between Morro Bay and the Santa Barbara Channel may be minimally effected from 3 to 5 oil and gas structures introduced into the offshore viewshed for 20 to 40 years, and intermittent minor conflicts with boat wakes, increased noise levels and residual pollutants associated with major or minor accidents are likely to occur. The The overall level of recreational use and associated economic activity in Santa Barbara or San Luis Obispo counties should be unaffected by Proposed Sale No. 73 as proposed.

Tourism. Proposed Sale No. 73 is unlikely to have a significant impact on the tourism industry within or outside the proposed sale area. Minor pollution incidences (visual, water, air) offshore and onshore within the proposed sale area will detract from the aesthetic quality of the tourism environment in selected areas but is unlikely to have local or regional effects on the tourism industry. Overall, Proposed Sale No. 73 is expected to have a very low impact on tourism.

Visual Resources. The expected development from Proposed Sale No. 73 is anticipated to have a low impact (minor degradation in visual quality offshore, most people accept the change, no reduction in recreation use or property values) to visual resources over the proposed sale area and none outside the proposed sale area. Offshore structures placed within three to five miles of shore will cause the most perceptible and lasting landscape changes, but these changes are unlikely to affect the local recreational habits or tourism levels in the impacted areas.

Cultural Resources. Low impacts (remote possibility of presence and disturbance of cultural resources) to cultural resources in Central California would be expected for the proposal. Localized moderate impacts (significant possibility of both presence and disturbance of cultural resources) could occur at Point Conception from offshore structures. The impact to submerged resources is difficult to determine because of the lack of investigation for submerged resources undertaken in Central California.

An oil spill, if it occurs, may seriously impact the intertidal area (refer also to Section IV.E.3.a) and impact the subsistence and ceremonial gathering of Native Americans and other ethnic groups. The likelihood of oil spill related impacts is low.

Ports and Harbors. High impacts to Port San Luis (or an alternative site that is approved by State and local planning jurisdictions) would be expected primarily due to competition for vessel berth-space and support facilities. This competition would lead to the need for additional docks, berths, and facilities. The additional vessel traffic and needs resulting from the proposal would only have a very low impact at the Port of San Francisco.

Marine Traffic. Low impacts to marine traffic in Central California and the Santa Barbara Channel area would occur as a result of Proposed Sale No. 73, Alternative I. Low impacts to the resource category means that vessel conflicts occur, but they are minor in character and occur infrequently.

Refineries. California refineries are assumed to have the capacity to process all Proposed Sale No. 73 crude oil that is shipped or piped to them (25 percent of the production would be tankered to the Gulf Coast for refining). The proposal partially contributes to the overall inducemnet of California refineries to make expensive modifications to the refining process to handle low quality crude oil from past and future (federal and state) offshore lease sales. This is considered to be a low impact to California (Greater Los Angeles area and San Francisco area) refineries.

In the event that California refineries are not able to process Proposed Sale No. 73 crude production, then some of the crude (in excess of the 25 percent anticipated) would need to be tankered to the Gulf of Mexico for refining.

Offshore Structures. Impacts to offshore structures will be confined to the Santa Barabara Channel since the only existing platforms are in this area. These impacts are expected to be low (affected structures would be repaired, with little, if any replacement; down-time would be only one or two days).

Military. Without the Military Stipulation, the overall impacts expected to military operations would be high (significant alterations or reductions to military operations would be required) as substantial overlap of military operating areas and the Proposed Sale No. 73 area exists (87 percent).

2. Alternative II - Modify the Sale to Protect Sensitive Biological Resources in the Morro Bay Area

a. Description of the Alternative: Alternative II would modify the proposed sale area by deferring from leasing in this proposed sale, three tracts and those portion of four tracts which coincide with a 10-mile zone centered on Morro Bay. Adoption of the alternative would have the effect of assuring that no leasing, and consequently no exploration and development activities would occur as a result of this proposal in 10 mile zone centered on Morro Bay (Figure II.A.2-1). The four partial tracts included in this alternative are among the tracts which are currently in litigation as a result of OCS Sale No. 53. The reader should bear in mind when considering the potential environmental impacts described for this alternative, that only in the unlikely event these four tracts become unencumbered prior to issuance of the proposed Notice of Sale (see description of Alternative I) would these tracts be available to be deferred from leasing in the context of a decision on this proposed sale. The environmental impacts described for this alternative assume that no leasing, exploration, or development will occur in the three whole and four partial tracts.

This area represents approximately 23,000 acres, the total proposed sale area (approximately 2 million acres) would be reduced by approximately 1 percent through the adoption of this alternative. For the purpose of environmental analysis we have assumed that the deferral of these tracts would not significantly change the overall resource estimates, the development and transportation scenarios, nor the predicted numbers of spills from the proposal.

Morro Bay is considered one of the largest and most significant bay wildlife habitats on the California Coast. The area is also used for recreation, bird watching, hunting, sportfishing and oyster mariculture. At low tide, approximately 1,400 acres of tidal mud flats are exposed (NOAA, 1982). The tidal flats, salt marshes, and adjacent habitats of Morro Bay provide an extensive feeding ground for various species of shore birds and waterfowl. Seabird colonies occur on Morro Rock and the estuarine areas behind it. Many migrant shorebirds commonly use the coastal waters (up to 100 meters depth) along the coast as well as the Bay and its estuarine habitats. Five endangered or threatened species utilize the bay or adjacent coastal habitats. The upper edges of the tidal mud flats are also rich in invertebrate species.

If this Alternative is selected, expected impacts on the Physical, Biological and Socioeconomic Environment would essentially remain the same as those impacts identified with the proposal, i.e., low or very low. Although there is a slight reduction in acreage, no change is assumed for the resources or the development and transportation scenario. Thus, one spill is expected through the adoption of Alternative II. This oil spill is not expected to contact land near Morro Bay.

However, eliminating tracts through selection of this Alternative would afford protection for these resources by 1) allowing additional time for cleanup, containment and weathering should an OCS platform spill occur, and 2) ensuring visual impacts would not exceed a low level due to platform placement. These points are discussed in the following paragraphs.

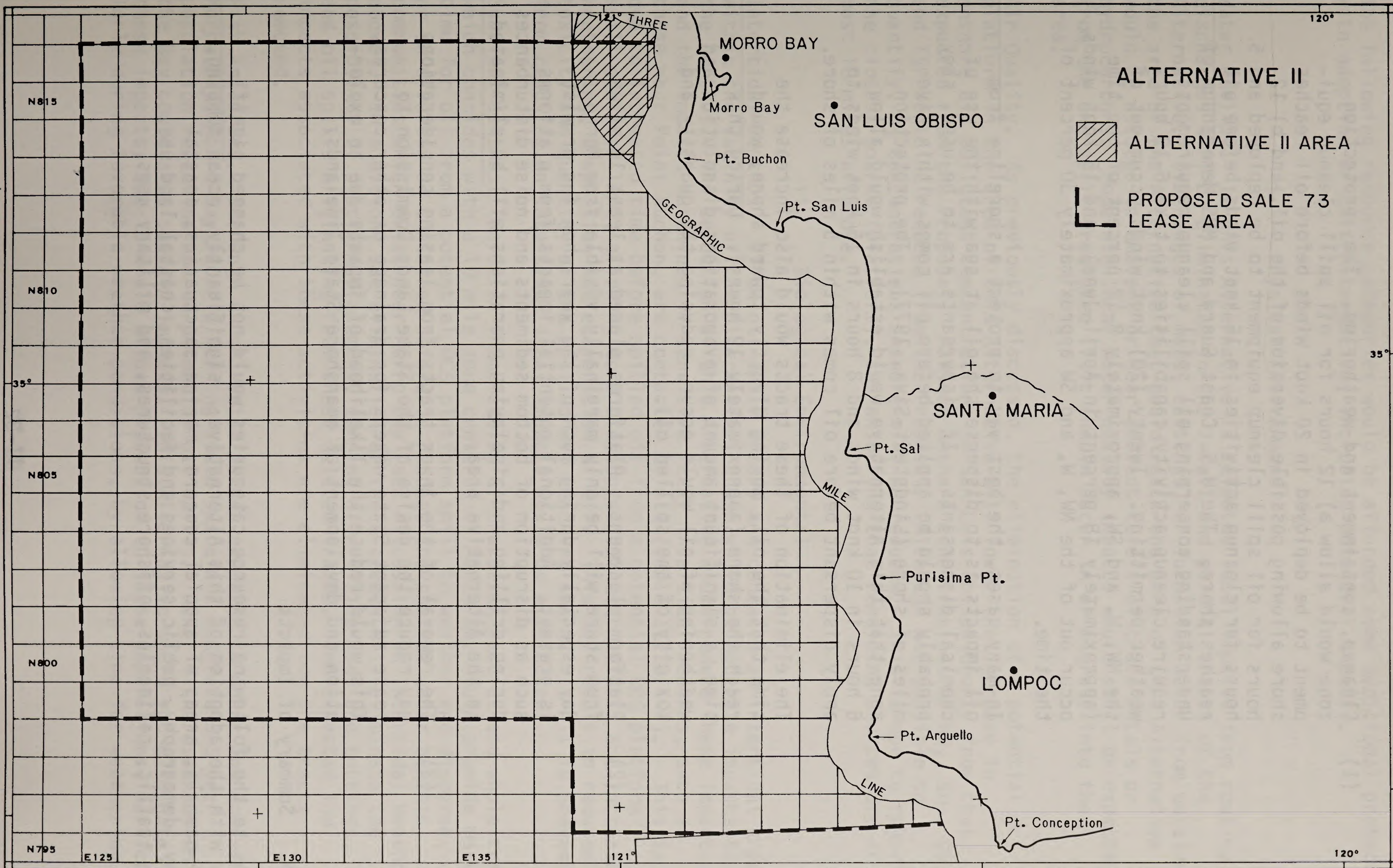

FIGURE II.A.2-1 ALTERNATIVE II–MODIFY THE SALE TO PROTECT SENSITIVE BIOLOGICAL AREAS.

(1) Cleanup, containment and weathering. The protection zone would allow a) 12 hours for oil spill cleanup equipment to be deployed in 20 knot winds before oil reaches shore allowing possible diversion of the oil, and b) 12 hours for oil spill cleanup equipment to be deployed and 5 hours for cleanup activities in 15 knot winds before oil reaches shore. The U.S. Coast Guard and MMS Memorandum of Understanding concerning oil spill cleanup requirements require cleanup activity capabilities to take 6-12 hours, weather permitting. Twenty (20) knot winds occur out of the NW, W, and SW, approximately 8-12 percent of the time (approximately 18 percent in April-June), and 15 knot winds occur out of the NW, W, and SW approximately 30 percent of the time.

In many cases, the best way to protect a shoreline from oil impacts is to disperse the oil at sea with the use of chemical dispersants. If dispersants are to be used, they probably should be applied before oil comes within five miles of shore (Lindstedt-Siva, 1977). The protection zone that this Alternative would establish would allow 6 hours in 10 knot winds and 8 hours in 15 knot winds to apply dispersant before oil comes within 5 miles of shore.

The elimination of these tracts would also increase the time that the oil, moving directly toward shore, would reach the shore (approximately 12 hours). During this time, a significant amount of evaporation, dissolution and weathering of oil would occur, reducing the quantity and toxicity of the spilled oil.

(2) Platform placement. Platforms placed at least 10 miles from shore will be only marginally visible from Morro Bay especially during much of the year when fog or mist is present. Additional potential impacts from platforms such as disruption of bottom sediments and noise disturbances during drilling and pipelaying operations will be eliminated in the Alternative area.

(3) The removal of the inner tracts from leasing considerations may reduce the desire of the State Lands Commission to lease adjacent State waters for drainage or other concerns. This would reduce the likelihood of impacts due to exploration and development of nearshore State Tidelands.

b. Summary of Impacts

Impacts to the following resource categories would not be changed significantly with the adoption of this Alternative: significantly, ocean dumping, marine mammals, areas of special concern, marine sanctuaries, coastal economy, demography, public services and facilities, coastal land use, marine traffic, refineries, offshore structures, and military uses.

The following resource categories would be afforded some additional protection with adoption of this Alternative, including potential impacts.

i. Physical Environment

Water Quality. If this Alternative is selected local impacts from routine discharges will be eliminated in the 7 full and partial tracts of the Alternative. Discharges of muds, cuttings, or formation water from outside the area of the Alternative that could reach the area of this Alternative would be diluted to ambient or near ambient levels of trace metals or hydrocarbons. Moderate local water quality impacts would still be expected from the one spill predicted if it should occur in or migrate into the area.

Air Quality. As previously discussed, the elimination of a potential platform in the area of this Alternative will lower the increase in onshore air pollutant concentrations in San Luis Obispo County from that expected from the Proposal. Maximum onshore conentrations of NO_x, SO_2, CO, and TSP would be reduced from the Proposal. Although not possible to quantify, O_3 concentrations onshore will be reduced. This is due to removing the closest source (platform), and ensurring that remaining sources are at most 10 miles offshore.

ii. Biological Environmental

Intertidal Benthos. If an oil spill occurs and contacts an intertidal area within the vacinity of the Alternative, there would be moderate impacts to the benthos. The selection of this Alternative would reduce these impacts and the impacts sustained if sensitive rocky intertidal beaches, such as those near Point Buchon, are contacted by oil (Table III.B.1-1). This is due to increased time before spilled oil from a potential OCS platform spill contacts land, allowing more cleanup/containment efforts and increased weathering, dispersion and evaporation of oil. This may result in reduced toxicity and quantity of the spilled oil reaching shore. If oil is prevented from reaching an intertidal area, impacts would be eliminated.

Subtidal Benthos. Deletion from leasing of the seven partial and whole tracts which concides with a 10 mile zone centered on Morro Bay would provide more time for oil from a potential OCS platform spill to weather and disperse, or be diverted or contained before is reaches the shallow water benthic communities which exist near Morro Bay (see discussion on Intertidal Benthos above). In addition, the elimination of these tracts will eliminate the possibility of platform placement, dumping of drilling muds and cuttings, and oil spills originating from these deleted tracts. The expected low impacts associated with these activities are eliminated for the tracts removed.

Fish Resources. Although an oil spill is not expected to occur and contact Morro Bay, Morro Bay Pacific herring could sustain a moderate 3-5 year population reduction due to potential oil spills. Other fish resources in the Bay could also sustain impacts. This Alternative would not eliminate these impacts, but it would afford protection to these populations, particularly during favorable weather conditions, by allowing time for weathering, diversion, and clean-up of any oil spilled during exploratory or development drilling and related operations.

Seabirds. The Morro Bay area is used extensively by local and migrating birds for habitat and food sources. Morro Bay is part of the Pacific Flyway, the migratory pathway that myriads of waterfowl, shorebirds and other water-associated birds follow from their northern breeding grounds to the their wintering grounds. The birds utilizing Morro Bay and the adjacent coastal habitats include the following protected species: American peregrine falcon, California brown pelican, California least tern, California clapper rail, California black rail, and non-protected species such as herons, egrets, black brants and many other waterfowl and wading birds.

Impacts to species in this area were estimated to be very low under Alternative I, since no oil spills were expected to occur and contact land. However, should a spill enter the estuary, impacts could be moderate to high requiring 1 to 2 decades for recovery of the species and their habitat.

Selecting this Alternative would reduce the potential impacts from OCS platform-related spills due to increased time before contact (see Intertidal Benthos above for more details). If an oil spill can be prevented from reaching the estuary and other bird habitat, impacts to this area would be eliminated.

Endangered and Threatened Species. Southern sea otter, California brown pelican, American peregrine falcon, salt marsh harvest mouse and Morro Bay kangaroo rat utilize the Morro Bay area and nearby coastal habitats. Under the proposal, none of these species are expected to experience significant impacts since oil spills are not expected to occur and contact any significant habitat.

However, in the event a spill reaches the area between Point Estero and Pt. Buchon or enters Morro Bay, the most likely impacts to the species or California populations would be as follows: southern sea otter - high; brown pelican - low; peregrine falcon - low; salt marsh harvest mouse - moderate or high. Low impacts would likely mean mortality to a few percent of the species or California population with recovery requiring a few years. Moderate to high impacts would require several decades for recovery.

Selecting this Alternative would reduce the impacts from OCS platform related spills due to increased time before contact. Also, if oil can be prevented from entering the area by booming, containment or dispersants, these impacts could be reduced to insignificant.

Estuaries and Wetlands. In the event an oil spill occurs and contacts Morro Bay, high to very high impacts could result. If a large spill covers the surface of the tidal mud flats and remains for several days, significant interference with the ecological relationship (feeding and breeding grounds) lasting over 10 years could result. Some species within the estuaries, if endemic, may be permanently eliminated. With the adoption of the Alternative, the likelihood of potential high impacts from oil spill resulting from the proposal contacting Morro Bay would be reduced (see Appendix A for impact definitions).

If oil can be prevented from entering the area by booming, containment or dispersants, these impacts could be reduced to insignificant. See Intertidal Benthos for a discussion of the reduction of potential impacts of oil spills with the adoption of this Alternative.

iii. Socioeconomic Environment

Commercial Fisheries. Although unlikely, Morro Bay oyster mariculture operations and Cayucos mariculture operations could each sustain moderate economic losses for about one month. Also, although unlikely, Morro Bay fishermen could sustain very high economic losses during the period oil hits shore due to port closure, closure, if a large oil spill occurred and came to shore at this port. This alternative would not eliminate these impacts but it would afford protection to these fishermen, particularly during favorable weather conditions, by allowing additional time for weathering, diversion or clean-up of any oil spilled during exploratory or development drilling and related operations. Overall expected impacts will not change with the adoption of this Alternative.

Sportfishing. The selection of this Alternative would locally reduce the possible impacts to Morro Bay sportfishing activities. This is due to the decreased likelihood of an oil spill impacting the harbor area, and the accompanying closure of the bay. The increased time available prior to oil spill contact would assist clean-up and containment activities, and decrease the potential toxicity of the oil by allowing more time for weathering and dispersion to occur.

Recreation and Tourism. This Alternative would locally reduce or eliminate the potential for oil and gas activities to impact the visual and aesthetic resources of Morro Bay, both of which contribute to recreational enjoyment and the attraction of tourists to the area. This would be due to the elimination of any offshore platforms and related activities being located immediately adjacent to the Morro Bay coastline. Oil and gas stuctures may be considered visually degrading by coastal residents, and tourists as well. Those tourists seeking a uncluttered, pristine view of the Pacific ocean may not be attracted back to Morro Bay for future vacations if development occurred. The presently pristine view offshore of Morro Bay would be protected by this Alternative. Additionally, the potential for oil spills impacting any of Morro Bay's important recreation or tourist areas would be reduced since the origin of platform-related oil spills would be more distant from these areas. The increased distance the spill would have to travel to reach Morro Bay would create additional time for oil spill clean-up and containment efforts, and allow additional weathering and dispersion of the spilled oil. Overall, impacts to the recreation and tourist activities in Morro Bay from the adoption of this Alternative would be reduced from low to very low.

Visual Resources. The impacts from offshore platforms on Visual Resources off Morro Bay were based on the Granville Corporation Study (1981). The impact levels were determined by the expected change in the aesthetic resources of the area based on OCS development. Impacts from platforms three miles offshore to visual resources of the Morro Bay area would be low. With the selection of this alternative, platforms would not be constructed within the Alternative area. Localized visual resources impacts would be reduced or eliminated through the adoption of this Alternative.

If an oil spill contacts the shoreline, an additional degradation to the visual quality of the bay would occur. This degradation would remain until cleanup operations are accomplished by either man or natural processes. If a spill contacted Morro Bay, a high impact would be expected. With the selection of this alternative, the likelihood of a spill from the proposal contacting the bay would be reduced.

Cultural Resources. Deletion of the nearshore Morro Bay tracts would remove approximately 23,000 acres (less than 1% of the proposed lease sale area) from possible impacts to known and as yet unidentified cultural resources in the Morro Bay area (i.e., shipwrecks). Three of the tracts have already been listed for invocation of the cultural resource stipulation due to reported historic shipwrecks in the area. This Alternative would eliminate the impacts to these sites.

Ports and Harbors. The potential impacts will be slightly reduced to Morro Bay as more time is afforded for oil spill clean-up, diversion and weathering, evaporation, and dispersion of oil in the event of a platform spill before contact with shore.

3. Alternative III - Modify the Sale to Protect Sensitive Resources in the Central San Luis Obispo County Coastal Area

a. Description of the Alternative: Alternative III would modify the proposed sale by deferring from leasing 29 tracts located offshore the central portion of the San Luis Obispo County coast (see Figure III.A.3-1). Adoption of this alternative would assure that no leasing, and consequently no exploration and development activities would occur in these 29 tracts. Nineteen of these tracts received bids and are currently in litigation as a result of OCS Lease Sale No. 53. The reader should bear in mind when considering the potential environmental impacts described for this alternative, that only in the unlikely event that these tracts become unencumbered prior to issuance of the Notice of Sale (see descripion of Alternative I) would these tracts be available to be leased in the context of a decision on this proposed sale.

The environmental impacts described for this alternative assume that leasing, exploration, or development will not occur on the 29 tracts in this alternative. The area within this alternative represents approximately 158,000 acres (63,000 hectares) or 8 percent of the area within the proposed sale area boundary. With the adoption of Alternative III, the Most Likely Resource Estimate of the total undiscovered recoverable oil and gas which would remain in the proposed sale area would be reduced to 210 million barrels of oil and 210 billion cubic feet of gas (Table II.A.3-1). This represents a decrease of 28% for oil resources, and a decrease of 26% for gas resources. The number of platforms required to develop the remaining resources are estimated to be four. This represents a decrease of 20%, as the Proposal is estimated to require five platforms. The offshore intrastructure required to develop the remaining resources is presented in Table II.A.3-1.

Table II.A.3-1

Comparison of Alternative III to the Proposal (Most Likely Volume Scenario)

	Proposal	Alternative III
Billion Barrels of Oil	0.29	0.21
Trillion Cubic Feet of Gas	0.28	0.21
Marginal Probability HC	1.00	1.00
Exploration Wells	12	9
Development Wells	9	7
Production Wells	155	125
Platforms	5	4
Subsea Completions	0	0
Estimated Number of Oil Spills		
Large (≥1,000 bbls)	.90	.65
Very Large (≥10,000 bbls)	.40	.28

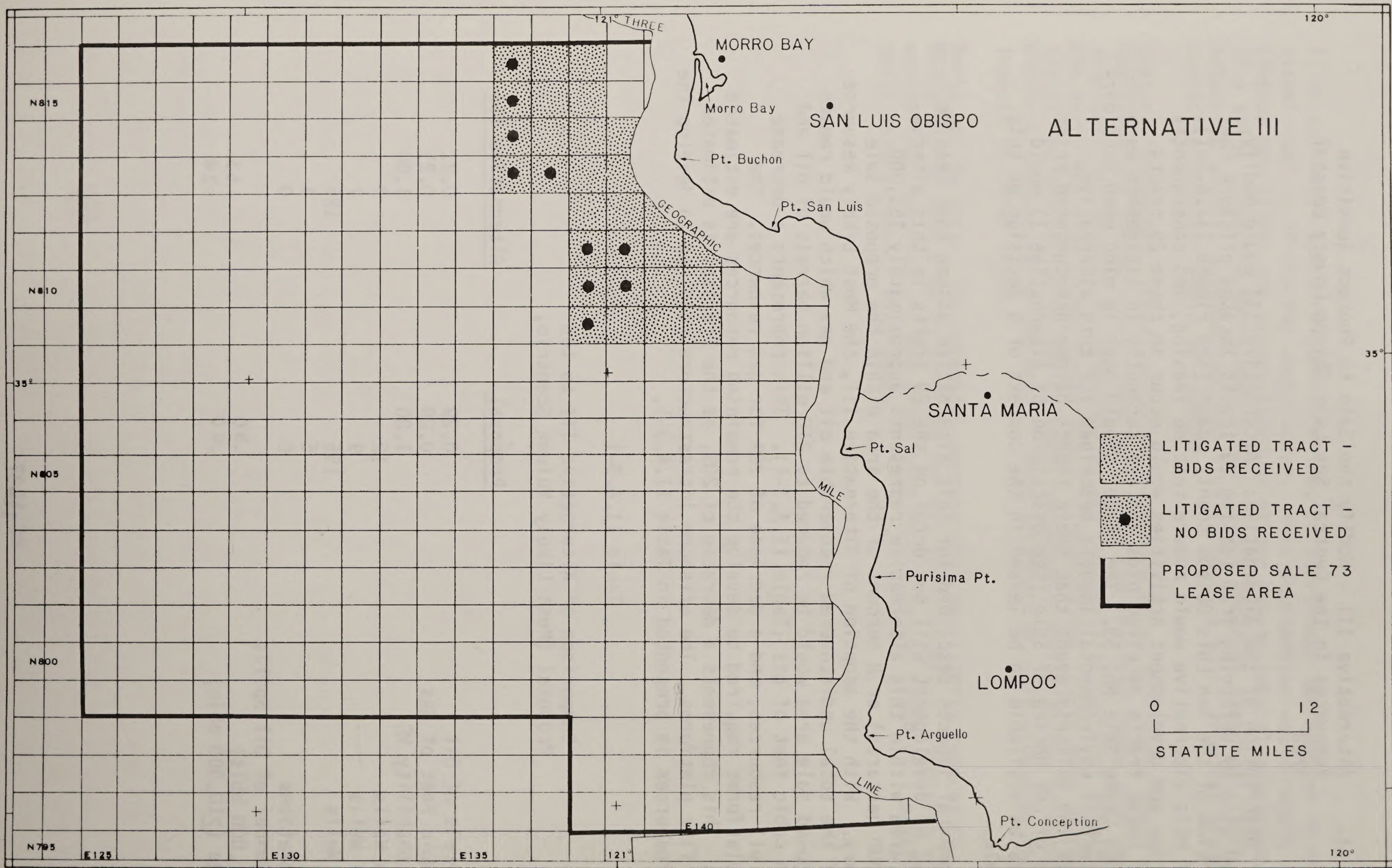

Figure II.A.3-1 Alternative III - Modify the Sale to Defer Tracts Off San Luis Obispo County

This coastal and onshore area is used extensively for recreation, commercial and sportfishing, and hunting. The northern portion of this area is near Morro Bay, one of the largest and most significant bay wildlife habitats on the California Coast (see Alternative II). In addition, the area includes a large part of the southern sea otter habitat (see Section III.B.4), a federally protected species, and sensitive rocky intertidal areas, important biologically.

The number of large oil spills ($\geq$1,000 bbls) estimated to occur as a result of selection of this alternative remains one, as for the Proposal. The number of very large oil spills ($\geq$10,000 bbls) statistically expected with a 25% or greater chance of occuring decreases from one (for the Proposal) to none for this alternative. The number of spills estimated to occur and contact the various resource targets showed some decrease when compared to the Proposal. The sea otter range showed no expected spill contacts, as for the Proposal. The potential risk of an oil spill is, however, further reduced, as the sea otter range is adjacent to the tracts included in this Alternative. The Channel Islands Marine Sanctuary (northern islands) showed a decrease from one expected spill occurrence and contact to 0.0 expected spills occurrence and contact. This would reduce any significant impacts to the resources of the sanctuary, such as fish, seabirds, and marine mammals. The individual land segments showed no expected spill occurrence and contact, as for the Proposal. Though no spill contacts were expected, land segments #25 (Port San Luis area) and #39 (northern side of San Miguel Island) again showed the highest potential for spill contact. This potential is, however, reduced with the selection of this alternative.

All of the impacts described for the proposal remain the same, with the exception of the following differences. All of the impacts would be eliminated in the immediate vicinity of the 29 tracts deferred, from activities originating within the alternative area, if selected. These impacts result from platform placement, potential oil spills, increased vessel traffic, and related support activities.

The main advantages of selection of this alternative are enumerated below, followed by an overall discussion by resource category.

(1) Creation of a buffer zone a minimum of 12 miles for the San Luis Obispo Coast north of the existing leases. This will allow approximately 14 additional hours (if wind is blowing directly onshore at 20 knots) for oil spill cleanup activities including dispersant use; allow oil spilled to further evaporate, disperse, sink, photo-oxidize, and weather, resulting in a smaller volume and less toxic level of any oil reaching shore. This will represent a significant additional margin of protection for the important biological coastal resources between Point Buchon and Point San Luis. These resources in the area include ports and harbors, intertidal benthos and the protected sea otter. Both the benthos and the sea otter are considered

to be vulnerable to oil spills (Section III.B). In many cases the best way to protect a shoreline from oil impacts may be to disperse the oil at sea with chemicals. If chemical dispersants are to be used, they should probably be applied before oil comes within 5 miles of shore (Linstedt-Siva, 1977). The use of chemical dispersants as well as conventional mechanical cleanup techniques will be more effective with increased time before spilled oil reaches shore.

(2) The onshore air quality degradation to San Luis Obispo County would be reduced. This would be due to the emission source (platform) being located further offshore with the elimination of one platform in the alternative area.

(3) Significant reduction in impacts to commercial trawl fishermen who fish in the alternative area. This would be the result of eliminating 27 tracts that overlap with commercial trawl grounds, including 10 tracts that are important shrimp trawling grounds (see discussion below).

(4) Elimination of visual resource degradation and impacts in tourism and recreation between Point Buchon and Port San Luis due to the elimination of any structures in the Alternative. This Alternative would reduce expected impacts to tourism and recreation from low to very low for the Alternative area, especially recreational beaching.

b. Summary of Impacts

The following resources will be afforded some additional protection, reducing potential impacts.

i. Physical Environment

Water Quality. If this Alternative is selected the impacts to water quality would be slightly lower on a regional basis than as described for the Proposal (Alternative I) due to the elimination of one platform predicted in the Alternative area. The volumes of materials discharged from routine operations would decrease by about 100,000 barrels of mud, 70,000 barrels of cuttings, 22,000,000 barrels of formation water, and 3,800 gallons per day of sewage. Thus, the impacts to water quality would be slightly lower on a regional basis but still described as very low.

The impacts to water quality on a local basis would be as described in the Proposal (Alternative I); moderate (within 300 meters of discharge), low (within 1,000 meters of discharge point), and very low (outside 1,000 meters). However, local impacts to water quality will be almost eliminated in the 29 tracts off San Luis Obispo County if this Alternative is selected. Local impacts would be eliminated because there would be no routine discharges on these tracts and pollutants from muds, cuttings, or formation water, from activities outside the area of this Alternative that could reach the area of this Alternative, would be diluted to ambient on near ambient levels of trace metals and hydrocarbons. Moderate local water quality impacts could still occur from the expected one spill should it occur in the area or move with currents into the area.

Air Quality. The elimination of one platform will lower the increase in onshore air pollutant concentrations in San Luis Obispo County from that expected from the Proposal. Maximum onshore concentrations of NO_X, SO_2, CO, and TSP would be reduced from the Proposal. Although not possible to quantify, O_3 concentrations onshore will be reduced. This is due to removing the closest source (platform), and ensurring that remaining sources are at most 12 miles offshore.

ii. Biological Environment

Intertidal Benthos. Adoption of this Alternative will not change the expected impacts on the intertidal communities within the proposed sale area. No large oil spills are expected to occur and contact intertidal areas from the Proposal, however, if an oil spill did occur and contact sensitive rocky intertidal areas such as those just north of Point Buchon to Point San Luis (Table III.B.1-1) moderate impacts would occur. These potential impacts will be reduced with this Alternative by allowing additional time for clean-up operations and further evaporation, dispersion, and break-up of any oil spilled from OCS platforms.

Subtidal Benthos. Adoption of this Alternative would remove the possibility of any platforms from being placed in the Alternative area. One platform was predicted for this area, resulting in high impacts within 100 meters of the platforms and low impacts from 100 to 1,000 meters from the platform from the dumping of drilling muds and cuttings.

No change in impacts from oil spills is expected as no spills are expected to occur and contact shallow water subtidal areas. If an oil spill did occur, and contact subtidal areas, low to moderate impacts are expected to kelpbed-associated organisms in shallow water benthic communities. Selection of this Alternative will reduce the potential impacts of oil spills as more time will be afforded with the placement of platforms further from shore. This additional time will allow increased clean-up efforts, weathering, dispersion, and thereby reduce the quantity and toxicity of any platform spilled oil when it contacts the coast.

Fish Resources. No significant impacts to fish resources from the Proposal are expected. Therefore, adoption of this Alternative would not change expected impacts to fish resources. Although impacts to fish resources from oil are unlikely, oil could contact fish resources. Protection afforded fish resources from this alternative would be minor.

Marine Mammals. Adoption of this alternative would reduce impacts slightly. Noise and disturbance were expected to cause low impacts to harbor seals concentrations near Point Buchon and Point San Luis. Elimination of the platform would decrease boat and aircraft traffic near haul out and pupping areas. Local impacts would be reduced from low to very low. Regional impact levels would remain the same.

Seabirds. Expected regional impacts remain low to moderate with adoption of this Alternative. However, adoption of this Alternative would provide protection for Morro Bay. See Alternative II for a discussion of bird resources. Coastal feeding areas would also receive protection due to increased time for clean-up, containment and weathering.

Endangered Species. This Alternative would provide protection from a a potential OCS related oil spill by allowing increased time for clean-up, containment and weathering of oil.

Up to 200 sea otters used the coast between Point San Luis and Point Estero. Fish and Wildlife Service has stated that the "potential for growth is greatest near the ends of the range...Even a relatively small oil spill coupled with other increased man-caused mortality could set back population growth at the southern end of the range..." Although no spills greater than 1000 bbl are estimated to occur and contact the otter range, potential impacts, should a spill occur, could be high to very high (recovery requiring one to several decades).

Small oil spills ($\leq$1000 bbls) could also slightly increased sea otter mortality. Adoption of this Alternative would reduce expected low local impacts due to oil spillage from low to very low due to removal of small sources such as boats and exploration activities.

In addition the area is a feeding ground for brown pelicans. Peregrine falcons nest at Pismo Beach. Impacts, in the unlikely event of an oil spill would be low.

Boat and aircraft traffic is also expected to cause disturbance and possibly very low mortality to sea otters. This Alternative would reduce these expected impacts to the sea otters from low to very low.

In conclusion, this Alternative will provide a protection zone for sea otters and other endangered species. Expected local impacts would be reduced from low to very low.

Estuaries and Wetlands. Adoption of this Alternative will not change the expected impact levels, as none were expected. If oil did enter an estuary, such as San Luis Creek, high impacts could be sustained. The entrance to this creek is less than 100 meters (Table IV.E.2.g) making it very feasible to boom the entrance, depending on weather and tidal conditions. It is estimated, however, that oil could enter if spilled from 28-35% of the time (depending on season and weather conditions). The selection of this Alternative will allow additional time before oil contacts shore should a platform spill occur, as the spill source will be further offshore. This will reduce potential oil spill impacts by allowing more time for clean-up efforts and the weathering, evaporation, and dispersion of the spilled oil. This will reduce the quantity and toxicity of any oil reaching shore.

iii. Socioeconomic Environment

Coastal Economy. The increase to the coastal economy expected from the Proposal will be reduced by 20% for permanent jobs, and by 17% in earnings, with this alternative. The population increase expected from the Proposal will be reduced by 12% with the selection of this Alternative. The net increase with the selection of this Alternative is approximately 387 permanent jobs, and an increase in earnings of approximately $75 million dollars.

Demography. This Alternative is expected to result in an increase in population of 640 people, or 87.8% of the increase expected with the Proposal.

Commercial Fisheries. Adoption of this Alternative would significantly reduce the localized expected impacts to trawl fishermen who fish in the Alternative area. This Alternative would remove 27 tracts that overlap commercial trawl grounds, including 10 that overlap an important shrimp trawl area. In 1981, roughly half of all fishing effort in the proposed sale area for the Pacific Ocean shrimp occurred in these tracts.

In 1981, the value of the Pacific Ocean (pink) shrimp fishery to the proposed sale area (using a multiplier of 3.1) was $1.7 million. The proposal is expected to result in: 1) moderate (10-20%) economic losses for at least 3 years to trawl fishermen who fish the Alternative area, due to pipelaying activities, 2) low (less than 10%) economic losses during years of peak activity to trawl fishermen who fish the Alternative area, due to loss of space and navigation hazards. Adoption of this Alternative would reduce or eliminate oil spills, manmade structures and vessel traffic in the Alternative area. Therefore, adoption of this Alternative would reduce economic losses to commercial trawl fishermen who fish the Alternative area to an insignificant level.

Concerns raised by the California Coastal Commission regarding fisheries are relevant to this Alternative area. See response to Comment No. 15c.10 in Section V.

Impacts to commercial fishermen in the remaining proposed sale area would remain as described in Section IV.E.3.e.

Although this Alternative is expected to significantly reduce expected impacts to trawl fishermen who fish the Alternative area, it is important to note that commercial fisheries is cyclical and varies considerably from year to year, and areas that are prime fishing areas now may not be prime fishing areas in the future.

Sportfishing. Selection of this Alternative would slightly reduce the likelihood of an oil spill impacting local sportfishing activities between Morro Bay and Port San Luis. The absence of platforms and exploratory vessels in the Alternative area eliminates potential space-use conflicts, but also eliminates the benefits to sportfishermen created by "artificial reefs." Although the impacts to sportfishing would be reduced, there would be no change from the low expected impact level.

Recreation and Tourism. Selection of this Alternative will reduce from low to very low, impacts to the area between Morro Bay and Port San Luis. This reduction would be due to the elimination of potential vessel traffic conflicts with recreational boaters, visual degradation of the coastline with offshore platforms and exploratory vessels, and the potential for an oil spill to impact important recreation and tourist areas.

Visual Resources. If this Alternative is selected the visual resources of this area will remain unaltered by oil and gas operations. This is a reduction from the Proposal which could result in visual intrusion by offshore platforms and drilling vessels. This Alternative will reduce the local impacts from low to very low.

Cultural Resources. Deletion of these 29 tracts will eliminate any possible impacts to shipwrecks from bottom disturbing activities within the 29 tracts. One of these tracts has been listed for invocation of the cultural resource stipulation due to a known historic shipwreck. This Alternative would protect any other shipwrecks which may be in the area. Locally, the very low expected impacts will be eliminated.

Ports and Harbors, Marine Traffic, Offshore Structures. Impacts to ports and harbors, marine traffic, and offshore structures will be slightly reduced due to the elimination of one platform, the number of exploration wells, and the accompanying support activity and tanker trips.

4. Alternative IV - Modify the Sale to Protect Sensitive Areas

a. Description of the Alternative

Alternative IV would modify the sale by eliminating 15 tracts located between Point San Luis and Purisma Point (see Figure II.A.4-1). This area represents approximately 62,200 acres (25,000 hectares) or 3 percent of the area within the proposed sale area boundary.

With the adoption of Alternative IV, the Most Likely Resource Estimate of the total undiscovered recoverable oil and gas which would remain in the proposed sale area after the tracts are deferred would be 280 million barrels of oil and 280 billion cubic feet of gas (Table II.A.4-1). This represents a decrease of only 3% of the estimated oil resources, and no decrease in the estimated gas resources or number of platforms required to develop these resources.

Table II.A.4-1

Comparison of Alternative IV to the Proposal (Most Likely Volume Scenario)

	Proposal	Alternative IV
Billion Barrels of Oil	0.29	0.28
Trillion Cubic Feet of Gas	0.28	0.28
Marginal Probability HC	1.00	1.00
Exploration Wells	12	11
Development Wells	9	8
Production Wells	155	150
Platforms	5	5
Subsea Completions	0	0
Estimated Number of Oil Spills		
Large (≥1,000 bbls)	.90	.86
Very Large (≥10,000 bbls)	.40	.38

This area is used extensively for recreation, commercial fishing and sport-fishing. It contains sensitive rocky intertidal areas such as Pirate's Cove, the Avila area, Mussel Point to Point Sal, Packard Point to Purisma Point (Table III.B.1-1), the rich Pismo Clam area of Pismo Beach, the Santa Maria estuary, and Port San Luis. In addition, seven of the tracts of this alternative have known historic shipwrecks located on them, and as a result are listed with the invocation of the cultural resource stipulation.

The number of large and very large oil spills estimated to occur as a result of this alternative are each one - no change from the Proposal. This is due to the very small change in the amount of oil estimated. The oil spill model results show virtually no change in expected spill occurrences and

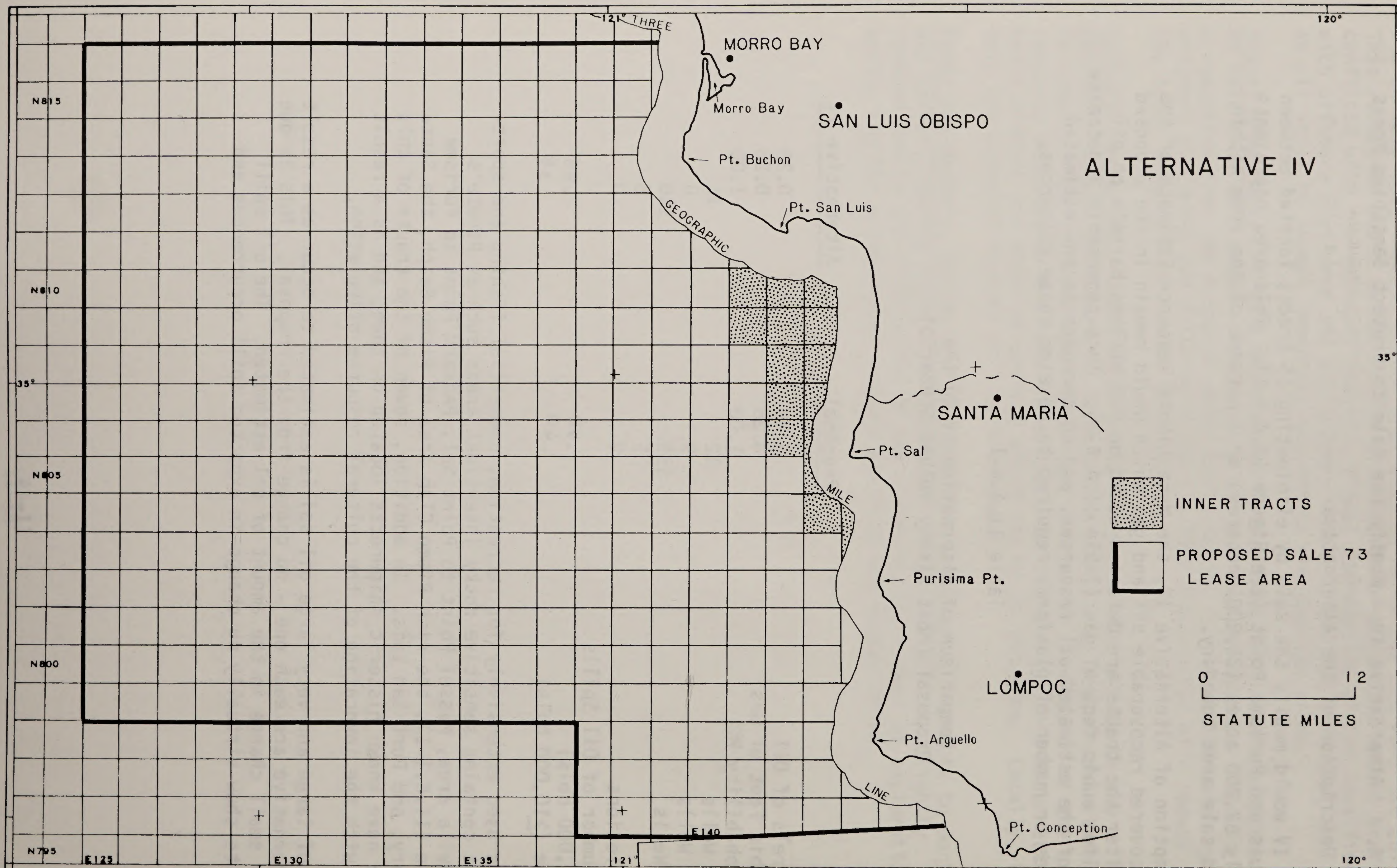

Figure II. A.4-1 Alternative IV - Modify the Sale to Protect Sensitive Areas contacts for the sea otter range, the Channel Islands Marine Sanctuary, or any of the land segments. The potential risk is, however, reduced for the otter range and coastal resources as these nearshore tracts lie close to a large portion of the range and the coast.

All of the impacts described for the Proposal remain the same, with the exception of the following differences. All the impacts would be eliminated in the immediate vicinity of the Alternative tracts, from activities originating within them. The main advantages of selection of this alternative are enumerated below, followed by a discussion by resource category.

(1) Creation of a buffer zone of up to 12 miles. This will allow approximately 14 additional hours (if the wind is blowing directly onshore at 20 knots) for oil spill cleanup activities, including dispersant use; allow oil spilled to further evaporate, disperse, sink, photo-oxidize, and weather, resulting in a smaller volume and less toxic level of any oil reaching shore. This will represent a margin of protection for the important coastal resources between Purisma Point and Point San Luis. These resources in the area include ports and habitats, intertidal benthos, and the protected sea otter. Both benthos and the sea otter are considered to be vulnerable to oil spills (Section III.B). In many cases the best way to protect a shoreline from oil impact may be to disperse the oil at sea with chemicals. If chemical dispersants are to be used, they should probably be applied before oil comes within 5 miles of shore (Linstedt-Siva, 1977). The use of time before spilled oil reaches shore.

(2) Significant reduction in expected impacts to commercial fishermen (trawl and set gear fishermen) who fish in the alternative area. Selection of this Alternative eliminates 14 tracts that overlap with an important commercial trawl ground for California halibut and tracts inside the 30 fathom curve where most of the set gear fishing is conducted in the proposed sale area.

(3) Elimination of 15 tracts including 7 with known historic shipwrecks, listed for invocation of the cultural stipulation. This Alternative eliminates the possibility of bottom disturbing activities (pipelines, platform placement, drilling muds and cuttings dumping) from originating in this area, and the subsequent possibility of disturbing an important cultural resource.

(4) The removal of the inner tracts from leasing considerations may reduce the desire of the State Lands Commission to lease adjacent State waters for drainage or other concerns. This would reduce the likelihood of impacts due to exploration and development of nearshore State Tidelands.

b. Summary of Impacts

The following resource categories would be afforded some additional protection with adoption of this Alternative, reducing potential impacts.

i. Physical Environment

Water Quality. This Alternative if selected would have almost no effect on the level of impacts to water quality of the overall area, because the volumes of materials expected to be discharged would remain almost as described for the proposal (Alternative I). The local impact from routine discharges will be eliminated in the tracts of this Alternative if this Alternative is selected. Discharge of muds, cuttings, or formation water from outside the area of this Alternative that reach the area of this Alternative would be diluted to ambient or near ambient levels of trace metals or hydrocarbons. Moderate local water quality impacts wouuld still be expected from the one spill predicted if it should occur in or migrate into the area.

Air Quality. The elimination of a possible platform within the area of this Alternative will lower the incrase in onshore air pollutant concentrations in San Luis Obispo County from that expected from the Proposal. Maximum onshore concentration of NO_X, SO_2, CO, and TSP would be reduced from the Proposal. Although not possible to quantify, O_3 concentration onshore will be reduced. This is due to removing the closest source (platform), and ensuring that remaining sources are at most 12 miles offshore.

ii. Biological Environment

Intertidal Benthos. Adoption of this Alternative will not change the expected impacts from the Proposal to intertidal communities within the proposed sale. In the event of a oil spill moving directly to shore, this Alternative will allow for more time for oil to weather or be diverted before it reaches the sensitive rocky intertidal areas such as Pirate's Cove, around Avila, Mussel Point to Point Sal, Packard Point to Purisima Point (Table III.B.1-1) and the rich Pismo Clam areas at Pismo Beach. This additional time would reduce the potential impacts (should a spill occur and contact) of moderate to the rocky intertidal areas, and high to Pismo Beach (during certain times of the year).

Fish Resources. Although an oil spill is unlikely to occur and contact the San Luis Obispo Creek area, the San Luis Obispo Creek Pacific herring population could sustain a moderate 3-5 year population reduction due to oil spills. This Alternative would afford protection to this population, particularly during favorable weather conditions, by allowing time for weathering, diversion or clean-up of any oil spilled during exploratory or development drilling and related operations. Impacts to fish resources in the remaining proposed sale area would remain as described in Section IV.E.2.c.

Seabirds. Adoption of this Alternative would provide protection for coastal feeding areas due to increased time for clean-up, containment and weathering.

Endangered Species. This Alternative would provide protection from a potential OCS related oil spill by allowing increased time for clean-up, containment and weathering of oil.

Although the number of sea otters counted south of Point San Luis is usually less than 100 animals, Fish and Wildlife Service has stated that the "potential for growth is greatest near the ends of the range...Even a relatively small oil spill coupled with other increased man-caused mortality could set back population growth at the southern end of the range..." Although no oil spills greater than 1000 bbl are estimated to occur and contact the otter range, potential impacts, should a spill occur, could be high to very high (recovery requiring 1 to several decades).

Small oil spills could also slightly increase sea otter mortality. Adoption of this Alternative would reduce expected local impacts due to oil spillage from low to very low due to removal of small sources such as boats and exploration drilling activities.

In addition the area is a feeding ground for brown pelicans. Peregrine falcons nest at Pismo Beach. Least terns, nest at the Santa Maria River. Impacts, in the unlikely event of an oil spill would be low (recovery requiring 1 to 2 years).

Boat and aircraft traffic is also expected to cause disturbance and possibly very low mortality to sea otters. This Alternative would reduce these expected impacts to the sea otters from low to very low.

In conclusion, this Alternative will provide a protection zone for sea otters and other endangered species. Expected local impacts would be reduced from low to very low.

Estuaries and Wetlands. In the unlikely event an oil spill moves directly to shore, this Alternative will allow more time for oil to weather or be diverted before it reaches the Santa Maria River estuary. Although Santa Maria River is open to the sea only intermittently, it is open during the winter when waves are largest and diversion of oil near its mouth is less effective than any other time of the year. Diversion or containment of an oil spill could prevent a high impact (see Appendix A for definitions of impacts) to this estuary. The adoption of this Alternative will reduce the potential of an oil spill entering the Santa Maria River Esturies.

iii. Socioeconomic Environment

Commercial Fisheries. Adoption of this Alternative would significantly reduce the expected impacts to trawl and set gear fisherman who fish in the Alternative area.

This Alternative would remove 14 tracts that overlap commercial trawl grounds for California halibut. Between 8/81 and 1/82, 15-20 percent of all fishing effort in the proposed sale area for groundfish (rockfish, California halibut, petrale sole, lingcod, English sole, rex sole, Dover sole) occurred in these tracts. Most of this effort apparently was for halibut.

In 1981, the value of the California halibut fishery to the proposed sale area (using a multiplier of 3.1) was \$1.1 million. About 40% of this halibut was taken by trawl. The Proposal is expected to result in: 1) moderate

(10-20%) economic losses for at least 3 years to trawl fishermen who fish the Alternative area due to pipelaying activities; and 2) low (less than 10%) economic losses during years of peak activity to trawl fishermen who fish the Alternative area due to loss of space and navigation hazards. Adoption of this Alternative would reduce or eliminate oil spills, manmade structures and vessel traffic in the Alternative area. Therefore, adoption of this Alternative would reduce to low economic losses to insignificant for commercial trawl fishermen who fish the Alternative area.

Concern raised by the California Coastal Commission regarding fisheries are relevant to this Alternative area. See response to comment No. 15c.10 in Section V.

Another fishery concern in the Alternative area is set gear fishing. Two main types of set gear are used in the Alternative area between Point San Luis and Point Sal: 1) traps to catch rock crabs inside 55 meters (180 ft, 30 fm); and 2) trammel nets to catch California halibut from 6-46 meters (18-150 ft, 3-25 fm). In 1981, the value of the rock crab fishery to the proposed sale area (using a multiplier of 3.1) was $0.4 million. As discussed above, the value of the California halibut fishery was $1.1 million. About 60% of this halibut was taken by trammel nets. The Proposal is expected to result in low (less than 10%) economic losses during years of peak activity to set gear fishermen who fish the Alternative area, due to navigation hazards and gear loss from vessel traffic. Adoption of this Alternative would reduce or eliminate oil spills, manmade structures, and vessel traffic in the Alternative area. Therefore, adoption of this Alternative would reduce economic losses to set gear fishermen who fish in the Alternative area to an insignificant level.

However, adoption of this Alternative would not change the potential impacts to commercial fisheries from oil spills. Fishermen who fish the Port San Luis Bay area still could sustain moderate economic losses for one month due to oil contamination of fishing gear and vessels, and Port San Luis (Avila) fishermen could sustain very high economic losses during the period oil hits shore due to port closure, if a large oil spill occurred and came to shore at this port. However, this Alternative would afford protection to these fishermen, particularly during favorable weather conditions, by allowing time for weathering, diversion or clean-up of any oil spilled during exploratory or development drilling and related operations.

Although this Alternative is expected to significantly reduce expected economic impacts to trawl fishermen who fish the Alternative area, it is important to note that commercial fisheries is cyclical and varies considerably from year to year, and areas that are prime fishing areas now may not be prime fishing areas in the future.

Impacts to commercial fishermen in the remaining proposed sale area would remain as described in Section IV.E.3.e.

<u>Sportfishing</u>. The area proposed for deletion from the lease sale by Alternative IV includes tracts off Pismo Beach, an important sportfishing and clamming area. The Pismo Beach clam reserve is also located adjacent to these tracts. Selection of Alternative IV would locally reduce potential

impacts to sportfishing in this area from low to very low. The potential for an oil spill impacting the beach (used by sportfishermen) and port facilities at San Luis would be locally reduced for the reasons given in the preceeding discussion on commercial fishing.

Recreation. Recreational activities in the area proposed for deletion by this Alternative include sportfishing, boating, picnicking and sightseeing. Pismo Beach is a heavily used area by recreationists. The Alternative would reduce the potential for a major oil spill impacting major recreation areas, most of which are associated with the local beaches. With this Alternative, scenic quality of the area would remain unchanged, and vessel activities offshore would be much reduced, thereby avoiding most conflicts between recreational boaters and oil and gas support vessels. Selection of Alternative IV would locally reduce impacts to the Port San Luis to Purisma Point area from low to very low.

Tourism. Tourism is directly affected by the availability of recreational opportunities and the quality of visual resources. In the area proposed for deletion from leasing by Alternative IV, sportfishing is also very important. Selection of this Alternative would reduce the potential for these resources to be adversely impacted in the event of a major oil spill. Degradation of visual resources would also be prevented since offshore structures would not be immediately visible. Since many tourists are presently attracted to this area because of its scenic quality and recreational opportunities, and the potential for altering these resources by oil and gas development would be removed, adoption of this Alternative would locally (in the Pismo Beach area) reduce the potential impacts to tourism expected from the Proposal, from low to very low.

Visual Resources. The deletion of the nearshore tracts off Pismo Beach, as proposed by Alternative IV, would eliminate the visual degradation possible from offshore structures, further the already low risks of a major oil spill impacting major recreation and tourist attractions would be reduced.

Cultural Resources. Deletion of the 15 tracts will remove these tracts from any bottom disturbing activities originating in this area. Seven of these tracts have been listed for invocation of the cultural resource stipulation due to known historic shipwrecks. Except possible disturbances from pipelines placement which may still cross this area the selection of this Alternative would eliminate potential impacts to these historic shipwrecks and any other shipwrecks which may be in this area.

Ports and Harbors, Marine Traffic, Offshore Structures. Impacts to ports and harbors, marine traffic, and offshore structures will be slightly reduced due to the reduction in the oil resources, exploratory wells, support vessel trips and tanker trips. This in turn reduces the potential accidents between vessels, vessels and offshore structures, and port congestion. This Alternative will reduce potential impacts in Alternative area.

5. Alternative V - Delay the Sale

a. Description of the Alternative: If the alternative of delaying Proposed Sale No. 73 is chosen, tracts would be withheld from a sale offering for a certain period of time. The period of delay would be governed by the reason for not leasing at the present time. A decision to delay the Sale could be made for any number of reasons, for example, to allow completion of further environmental studies, to allow advancement of deep water technology, or to allow further State and local onshore planning for anticipated effects from offshore oil and gas activities.

b. Summary of Impacts: Postponement of the Proposed Sale No. 73 would result in delay in the exploration, development, and production of oil and gas resources. Any economic or national security benefits which could be attributed to the domestic production of hydrocarbons in these amounts would be postponed.

Any of those impacts which could result form the proposal would not occur until the proposal is reinstated. During the delay period improvements may occur in technologies for oil spill prevention and recovery, deepwater drilling and production techniques, or for exploration and production in hostile environments which may lessen the risk of some adverse impacts. The actual degree of improvements depends on the timeframe of the delay. Also, new information on oil and gas resources may become available from drilling on adjacent existing leases and the economic feasibility of developing an area will probably improve.

Another reason for delaying Proposed Sale No. 73 could be to allow for the resolution of existing conflicts and to obtain additional information within the proposed sale area. Additional information from on going or future studies could enhance the knowledge of the environment and potential effects of OCS activities.

6. Alternative VI - No Sale

a. Description of the Alternative: This alternative removes the total area for proposed leasing at this time. All potential physical, biological, and socioeconomic impacts resulting from hydrocarbon exploration and development from Proposed Sale No. 73 would be eliminated at this time.

Although cancelling Proposed Sale No. 73 would eliminate all the impacts that are expected as a result of the proposal, impacts from oil and gas activities within the region would still result from existing oil and gas activities from the previous OCS Sale No. 53, the State Tidelands leasing and development (refer to Sections IV.C.3 and D.4), future OCS Lease Sales in this area, as well as importation of oil via tankers to refineries in the area (see Section III.C.13).

Changes to the Physical, Biological and Socioeconomic resources over the next 25 years without the proposal and future OCS Lease Sales, would still occur. Population expansion and associated impacts will continue, and would be directly or indirectly responsible for most problems and benefits associated with non-oil related changes in Central California.

The Summary of Impacts presented below represent the future of the environment without the proposal (see Section IV. J for a detailed discussion).

b. Summary of Impacts

i. Physical Environment

Water Quality. Water quality will continue to degrade in many bays and estuaries due to agricultural runoff, as well as domestic and industrial pollution. OCS waters will continue to receive trace metals (e.g., lead) due to the combustion of fossil fuels and subsequent aerial washout near major populations centers.

Dump Sites. New dump sites will be designated as their need arises, and positioning of these sites will be in areas of least potential environmental impact. Deterioration of the water quality will occur temporarily and locally at each of the dump sites; however, overall there will be minor changes. The impact from the dump sites are expected to remain at present levels.

Air Quality. Without the proposed project air quality would not change signifcantly from present conditions. Some increase in air emissions may be expected as a result of population growth and associated increase in vehicular traffic. Onshore emission sources are regulated by the local air pollution control districts and no new emissions sources would be permitted that would cause exceedance of the air quality standards. Furthermore, in ares that are classified nonattainment, new emission sources would be required to acquire offsets so that no net increase in emissions would result. Counties must submit air uality attainment plans designed to meet ambient standards by 1987 according to the Clean Air Act laws.

ii. Biological Environment

Intertidal Benthos. With the expected population expansion and development along the coast of Central California, some corresponding impact to the intertidal environment is expected. Although the rate of degradation will be decreased due to Federal, State and local commitments and legal mandates, the amount is non-quantifiable and unpredictable except in general terms. Within the proposal area impacts would be locally very low and low.

Subtidal Benthos. The principal non-oil effects to the subtidal benthos will come from pollution and waste disposal. Most of these impacts will be localized near cities, but the magnitudes of the impacts are difficult to predict, impacts within the proposed sale area would be locally low and moderate.

Fish. Fish populations are expected to experience large to very large decreases due to the combined effect of fishing pressure, sewage disposal, natural oil seeps, existing offshore oil and gas leases (Federal and State), new State leases proposed to be sold between Point Arguello and Point Conception, tanker transportation of foreign and Alaskan crude imports and other vessel traffic.

Marine Mammals. Marine mammals (pinniped and small cetaceans) will suffer impacts from several sources over the next 25 years. Sewage, increased tanker and recreational traffic, existing future hydrocarbon leases, expanding population centers along the coast, changing climatic conditions and other natural causes may change marine mammal distributions.

Without the proposal, some species are expected to suffer moderate to high reductions in local populations. Some species may suffer a general degradation in health due to pollutants. Overall, population numbers are expected to increase or remain the same; however, general levels of health may be slightly reduced.

Seabirds. Without the proposal, seabirds will suffer impacts from several sources over the next 25 years. Sewage, increased tanker and recreational traffic, existing leases (State and Federal), expanding population centers along the coast and changing climate conditions may reduce seabird distribution and populations. However, with increased conservation efforts it is possible many of these effects can be reduced.

If pollution levels remain constant or increase, some species may suffer low level impacts from several sources and a general degradation of health is possible. Overall, the impacts are expected to be low to moderate; that is, some individuals may die but most species are expected to maintain viable populations.

Endangered and Threatened Species. Without the proposal, Endangered Species will suffer impacts from several sources over the next 25 years. Sewage disposal, increased tanker and recreational traffic, expanding population centers along the coast, changing climatic conditions or other natural changes, and impacts from existing OCS leases may cause changes in species abundance and distributions. Some species such as brown pelicans, least terns, peregrin falcons and bald eagles seem to be recovering. Their biology is reasonably well understood and it is expected recovery should continue. Other species such as the rails are secretive animals and little of their habitat remains. Their future is much more tenuous. The survival of northern right whale and southern sea otter is also in question. Oil spills are always a serious threat to the sea otters. Overall it is expected some species will increase in numbers and distribution. Others, such as northern right whale may face extinction over the next 25 years.

Estuaries and Wetlands. With the predicted population expansion and development near wetlands, some corresponding degradation to these areas is expected. Although the rate of degradation will be decreased due to Federal, State and local commitments and legal mandates, the amount is difficult to predict except in general terms.

Areas of Special Concern. The above discussion of intertidal benthos can be applied here since most of the Sensitive Biological Areas are intertidal areas. Whether these protected areas will be degraded or upgraded in the future will primarily depend upon the quantity and quality of domestic pollution, enforcement and prevention of intertidal collecting, and reduction in the amount of human traffic allowed on the sensitive areas.

Pt. Reyes/Marine Sanctuaries. If the No Sale Alternative is chosen, parts of the Point Reyes/Farallon Island Marine Sanctuary will be affected from pollution contained in the outflow of San Francisco Bay. Both the Channel Islands National Marine Sanctuary and Point Reyes National Seashore could be impacted by import oil tanker accidents.

iii. Socioeconomic Environment

Coastal Economy. Without Proposed Sale No. 73, the study area is expected to experience a significant increase in the labor force and general economic activity. The labor force in the study area is projected to increase by 60.08 percent during the project period. However, the average increase in the labor force would be 1.18 percent per year of the base.

Demography. Selection of this alternative will result in the removal of all impacts associated with Alternative I. However, the study area is expected to have a large increase in population between 1980 and 2020. Population is expected to increase by 78.3 percent or an annual increase of 1.46 percent. The additional population is expected to result in an increased housing demand, reduced household size, and reduced rate of home ownership.

Public Services and Facilities. Increases in population of Central California, as projected by the State of California, will stress public services and facilities.

Coastal Land Use. Projected population growth using State of California figures will create a demand for intensive land use. Commercial and industrial growth will create demands for rezoning of existing land use. The demand and need for affordable housing will continue. Overall all types of housing will continue to be in demand from the increasing population. Local jurisdiction will have to deal with growth induced demands through Local Coastal Programs, Port Master Plans, and City and County General Plans.

Commercial Fisheries. Commercial fishermen are expected to sustain high economic losses due to the natural fluctuations in fish and shellfish populations, competition with other fishermen, changes in market conditions, restrictions on fish harvests, existing offshore oil and gas leases (Federal and State), new State leases proposed to be sold between Point Arguello and Point Conception, tanker transportation of foreign and Alaskan crude oil imports and other vessel traffic.

Sportfishing. Public participation in sportfishing is expected to increase slightly without the proposal. Limited transportation to fishing sites is the major restraint on continued growth. Sportfishing will be sufjected to natural fluctuations in fish and shellfish populations.

Recreation. Recreation will continue to grow in the absence of Proposed Sale No. 73, but will continue to risk impact from sources such as municipal sewage, regulated access, and rising costs.

Tourism. Tourism will continue to increase, even though gas shortages and economic recessions are possible during the same period.

Visual Resources. Visual resources will essentially remain at the present level with minor decreases due to residential development along the backshore and development of recreational facilities along the shore.

Cultural Resources. Due to population expansion more terrestrial and marine sites will be discovered. This will be accompanied by increased looting. However, a greater number of sites will be protected due to increased interest in conservation of sites, particularly on land.

Ports and Harbors. Import oil will increase potential conflicts at the Port of San Francisco. Oil development in Santa Maria Basin from OCS Sale No. 53 will increase the use of Port of San Luis, and ports in the Santa Barbara Channel.

Marine Traffic. Commercial vessels using the Traffic Separation Scheme through the Santa Barbara Channel would increase from about 19 to 38 percent between 1980 and 2000. A similar increase could be anticipated for the San Francisco area. Alaskan tankers will continue to carrying crude oil to the San Francisco and Los Angeles area refineries. Impacts from existing oil and gas activities and future increase in traffic would be moderate.

Refineries. Alaskan tankers will continue to the San Francisco and Los Angeles area refineries. Several refineries are presention performing modification to accommodate California crude. Without the proposal, impacts on refineries would be high. This is due to the need for modifications to handle low quality crude from past and futrue offshore California lease sales.

Offshore Structures. Present structures will remain and planned structures in the Santa Maria Basin from past sales and future State of California sales will be constructed. Low impacts would occur in the future in the sale area. These impacts would be higher in the Santa Barbara Channel.

Military. As coastal populations and vessel traffic continue to increase, conflicts with military activities will also increase. There will be less area available for exclusive military and joint military/civilian use. As a result, the military will have to alter their activities.

B. Comparison of Alternatives and Impacts

1. Alternative I - The Proposed Action

The proposed action is the offering for lease those unleased tracts within the proposed sale area (see Section II.A.1 for a complete description). Approximately 2 million acres or 360 tracts are located within the boundary of the proposed sale area. A Summary of Impacts expected to occur as a result of Proposed Sale No. 73 is contained in Section II.A.1.g.

2. Alternative II - Modify the Sale to Protect Sensitive Biological Areas

Alternative II would modify the sale area by eliminating 3 tracts and those portions of 4 tracts which coincide with a 10-mile zone centered on Morro Bay (see Figure II.A.2-1). This area represents approximately 23,000 acres (See Section II.A.2 for a complete description).

If Alternative II is selected, expected impacts would essentially remain the same as those impacts identified under Alternative I. With the slight acreage reduction, no change from Alternative I is assumed for the resource estimates, and the associated development and transportation scenarios. Thus as with Alternative I one oil spill is still predicted to occur. This spill is not expected to contact the land segments in the vicinity of Morro Bay (See Appendix F).

However, eliminating tracts through the selection of Alternative II would reduce the potential impact from an oil spill to contact to Morro Bay by allowing additional time for cleanup, containment and weathering should an OCS platform oil spill occurred. The potential impacts to Morro Bay from Alternative I range from very low to high from an oil spill, but with the adoption of alternative II and the prevention of an oil spill from contacting Morro Bay these impacts would be eliminated or reduced to insignificant.

Although there is no change in the development and transportation scenarios presented in Alternative I, Alternative II would prevent any of the impacts associated with the development and production of hydrocarbons within the Alternative area.

3. Alternative III - Modify the Sale to Protect Sensitive Area off San Luis Obispo County

Alternative II would modify the sale by deferring from leasing 29 tracts located offshore the central portion of the San Luis Obispo County coast (see Section II.A.3 for a complete description).

The estimated undiscovered recoverable oil and gas would be reduced by 28 percent from Alternative I. As compared in Table II.A.3-1, Alternative III would reduce the total number of wells and platforms by 20 percent. In addition, the reduction of resource estimates caused the statistical number of spills to be reduced (see Table II.A.3-1). The oil spill model results for resource targets and individual land segments show some decrease in estimated spill occurrence and contact (see Appendix F). The increase to the Coastal Economy expected from Alternative I would be reduced by 20 percent. The population increase from Alternative I would be reduced by 12 percent with the selection of Alternative III.

The selection of Alternative III would reduce the potential impacts to the San Luis Obispo County coast by providing approximately 14 additional hours for oil spill cleanup activities. The potential impacts from oil spills to this section of the coast for Alternative I range from very low to very high, but with the adoption of Alternative II and the prevention of an oil spill from contacting the coast these impacts would be reduced to insignificant.

With the deferral of these 29 tracts all impacts which could hae resulted from OCS activities on these tracts, from platform placement, potential oil spills and associated vessel traffic and support activities would be eliminated.

4. Alternative IV - Modify the Sale to Protect Sensitive Area from Point San Luis to Purisima Point

Alternative IV would modify the sale by eliminating 15 tracts located between Point San Luis and Purisima Point (see Section II.A.4). This area represents approximately 62,200 acres or 3 percent of the area within the proposed sale area boundary.

The estimated undiscovered recoverable oil and gas would be reduced by 3 percent from Alternative I. As compared in Table II.A.4-1, Alternative IV would reduce the total number of wells by 4 percent. The number of platforms would remain the same as in Alternative I. The reduction of resource estimates only slightly reduces the statistical number of spills (see Table II.A.4-1). The oil spill model results for Alternative IV shows virtually no change in expected spill occurrences and contacts for the sea otter range, the Channel Islands Marine Sanctuary, or any of the land segments (see Appendix F).

The selection of Alternative IV would reduce the potential impacts to the coastline between Point San Luis and Purisima Point by providing additional time for oil spill cleanup activities. The potential impacts to this section of the coast range from very low to very high. The adoption of this Alternative and the prevention of an oil spill contacting the coast would reduce these impacts to insignificant.

With the deferral of these 15 tracts all impacts which could hae resulted from OCS activities on these tracts, from platform placement, potential oil spills and associated vessel traffic and support activities would be eliminated.

5. Alternative V - Delay the Sale

Postponement of the Proposed Sale No. 73 would result in delay in the exploration, development, and production of oil and gas resources. A delay of the Sale may not change any of the impacts assumed to occur as a result of Alternative I. It would most likely postpone their occurrence. However, improvements may occur in technologies for oil spill prevention and recovery, deepwater drilling and production techniques, or for exploration and production in hostile environments which may lessen the risk of some adverse impacts. Also, new information on oil and gas resources may become available from drilling on adjacent existing leases and the economic feasibility of developing an area will probably improve.

6. Alternative VI - No Sale

This alternative removes the total area for proposed leasing at this time. All potential physical, biological, and socioeconomic impacts resulting from hydrocarbon exploration and development from Proposed Sale No. 73 would be eliminated at this time.

Although cancelling Proposed Sale No. 73 would eliminate all the impacts that are expected as a result of the proposal, activities within the region would still result from existing oil and gas activities from the previous OCS Sale No. 53, the State Tidelands development (refer to Sections IV.C.3 and D.4) and future OCS Lease Sales in this area, as well as importation of oil via tankers to refineries in the area (see Section III.C.13).

Changes to the Physical, Biological and Socioeconomic resources over the next 25 years without the proposal and future OCS Lease Sales would still occur. Population expansion and associated impacts will continue, and would be directly or indirectly responsible for most problems and benefits associated with non-oil related changes in Central California.

This alternative could cause our continued dependence upon imported oil and gas. Also, adverse environmental effects could result from continued and new production of domestic resources (e.g., coal, uranium, geothermal) in order to supplement existing energy sources. (See Section II.C Alternative Energy.)

C. Alternative Energy

Proposed Sale No. 73 is expected to lease tracts expected to contain undiscovered resources totaling approximately 291 million barrels of oil and 285 billion cubic feet of gas from 1988 to 2007. If this proposed sale was removed from further consideration, it could result in the continued or new development of alternate energy sources (see Table II.C-1). In order to supply the nation's energy needs without increasing our dependence upon foreign sources, the following alternate energy sources or actions need to be further explored.

1. Onshore Oil and Gas: The U.S. Geological Survey (1981) estimates that onshore, undiscovered, recoverable oil resources ranged from 42 BBO with a 95 percent probability and 71 billion barrels of oil (BBO) with a 5 percent probability (mean - 55 BBO). Onshore natural gas resources range from 320 trillion cubic feet of gas (TCFG) with a 95 percent probability and 570 TCFG with a 5 percent probability (mean 430 TCFG). It was estimated that 1980's new field discoveries contain ultimate reserves of 500 million bbl of crude oil and gas condensate and 4.1 trillion cu ft of gas.

Despite the magnitude of undiscovered resources, domestic oil production is likely to continue to slump. Factors causing the slump in the first quarter of 1982 include: lower crude prices, lower prices for deep gas, great uncertainty over taxes and elimination of incentives, and adverse weather conditions in much of the Anadarko Basin (OGJ Report, June 21, 1982).

These factors have caused varying amounts of activity in the exploration of oil and gas onshore. In the Utah-southwest Wyoming producing area of the Western Overthrust Belt, drilling has been fairly steady. There has been a slight reduction in the exploration in other locations of the Overthrust Belt and in the associated Hingeline of Central Utah.

Deep wildcat wells are still probing the Eastern Overthrust Belt. Based on the age of the rocks and the production to date, explorationists feel that the area may be gas prone, but it is still too early to rule out substantial oil discoveries at depth. Explorationists indicate that the "key" to unlocking the potential of the deep zones is probably 5 years away.

Activity in the Williston Basin of eastern Montana and North Dakota has decreased, although important discoveries have been found. High drilling and lease costs and falling prices have stopped activity (OGJ Report, June 21, 1982).

Activity in the Anadarko Basin was decreased partly due to a prolonged period of wet weather, in early 1982, and partly due to falling prices.

Onshore oil and gas development could entail environmental impacts such as land subsidence, increased erosion, loss of vegetative cover and wildlife habitat, increased air pollution, and disruption of existing land use patterns. Equipment failure, human error, and blowouts may also impair environmental quality. Water produced from EOR techniques, older well failures, and oil spills could result in ground and surface water pollution.

The magnitude of these impacts would depend on whether the increased production resulted from improved recovery methods or new discoveries. If improved recovery is realized, the impacts will likely be of lesser significance and will occur in already developed areas. Should new discoveries be found, the impact will be more significant and disruptive, as a whole new infrastructure would have to be built from the ground up. Additionally, development in some areas may be difficult to develop due to rugged terrain and would increase the cost of environmental protection.

2. Coal: The United States is self-sufficient in bituminous coal and lignite. The Federal government owns an estimated 60 percent of the coal resources in Colorado, Montana, New Mexico, North Dakota, Utah and Wyoming. At the close of fiscal year 1979, 546 leases covered a total of 799,250 acres containing an estimated 18 billion tons of coal.

Most of the bituminous coal produced in the United States is burned to obtain thermal energy for generating electricity, processing raw or manufactured materials, and heating industrial complexes. Other uses include carbonization, gasification and liquification.

The mining and combustion of coal can cause numerous environmental impacts to air, land and water. In the vicinity of the coal mine the problem of air pollution is principally related to fugitive dust from roads, transfer facilities, loading facilities, crushers, etc., and particulate matter (dust or fly ash) from thermal dryers and air cleaning tables. As coal, or any fossil or hydrocarbon fuel, is burned in a furnace to produce heat, products of combustion that may affect the environment have to be reduced to minimum concentration. Products of combustion are a complex mixture of gases and materials, mainly oxides of the fuel constituents--carbon, nitrogen, and sulfur--unburned carbon and a portion of the ash in the fuel. The ash material and unburned carbon in fine dust form is known as "particulate matter."

Coal can be mined by two methods, surface mining or underground mining. Production of coal by surface methods is now approaching 300 million tons annually, amounting to almost 50 percent of the total coal output. Mining by surface methods disturbs thousands of acres of land annually. In addition, refuse piles, slurry ponds, abandoned mine structures, unprotected mine openings, and unsightly cleaning plants can also adversely affect land unless properly handled.

The use of water in coal mining is somewhat different than in most industries. With the exception of the small amount of water used in cleaning plants and for fire protection, most of the water encountered in coal mining operations is unwanted since it serves no useful purpose. In other words, it must be removed, otherwise it will interfere with mining operations. Mine drainage includes all types of mine water associated with coal mining operations. Mine drainage from coal mines may be acid, alkaline, or neutral, depending on the type of rocks or strata the water passes through, the distance it travels, and the time it remains in contact with soluble minerals. It can contain a lot of impurities or only a small amount. Thus, not all mine drainage is bad water, but water quality is a problem.

3. Nuclear Power - Uranium: The predominant nuclear system in the United States is the uranium dioxide fueled, light water moderated and cooled nuclear power plant. Research and development is being directed toward other types of reactors, notably the breeder reactor and fusion reactors.

Although nuclear plants do not emit particulates or gaseous pollutants from combustion, the potential for serious environmental problems exists. Some airborne and liquid radioactive materials are released to the environment during normal operation. The amounts released are very small and potential exposure has been shown to be less than the average level of natural radiation exposure. The plants are designed and operated in such a way that the probability of harmful radioactivity released from accidents is very low.

Even though the probability of harmful radioactivity being released is low, there has been a large increase in public concern for the safety of these power plants. Attempts have been made to stop all future construction, and to shut down all existing nuclear plants in some areas. Dependence on this power source tends to preclude shut down as no suitable alternative is available.

Nuclear plants use essentially the same cooling process as fossil-fuel plants and thus share the problem of heat dissipation from cooling water. However, light water reactors require larger amounts of cooling water and discharge greater amounts of waste heat to the water than comparably sized fossil-fuel plants. The effects of thermal discharges may be beneficial in some though not all cases. Adverse effects can often be mitigated by use of cooling ponds or cooling towers, but these are consumption of water and land respectively.

Low level radioactive wastes from normal operation of a nuclear plant must be collected, placed in protective containers, and shipped to a Federally-licensed storage site and buried. High level wastes created within the fuel elements remain there until the fuel elements are processed. Currently, spent fuel is stored at NRC-licensed facilities. Plans call for recovering unused fuels at reprocessing plants, solidifying the wastes, and placing them in storage at a Federal Repository.

Although nuclear energy is a viable alternative energy source, uranium exploration and development has decreased. The factors which caused the reduction are 1) new and unexpected reactor cancellations and schedule delays, and 2) continued deterioration of the financial condition of the utility markets. The price of uranium has dropped from \$40.75/lb U_3O_8 on December 31, 1979, to \$17.50/lb U_3O_8 on October 31, 1982. This price decrease has caused numerous mines throughout the United States to shut down or reduce production.

The mining operation impacts are similar to those for coal mining with the exception of radioactive tailings and water being produced.

4. Geothermal Energy: Geothermal energy is the natural heat contained and continuously flowing from the earth. Today it is proving to be a viable source of energy for the generation of electricity and space heating. Workers in the field indicate that there are four different types of high grade geothermal reservoirs that may be exploitable; the hyperthermal

system, the geopressured system, the molten rock system, and the hot dry rock system. Only the hydrothermal system is nonviable.

The hyperthermal systems which are being exploited around the world today have extremely high temperatures (500-600°F), often occur at depths (frequently two miles). All occur in hot, fractured rock with a high water content. This water serves as a heat exchange medium which flows into the boreholes. The heat is then carried to the surface and to the electrical generating turbines with few technical problems. The pressure of the overlying rock and water generally keeps the water in the reservoir in liquid state, even when temperatures are far above the atmospheric boiling point. However, as the drill bit penetrates the cap rock of the reservoir, the pressure is relieved and the contained water flashes to steam. A few reservoirs such as those found at the Geysers, California and Lardarello, Italy, consist of superheated, high pressure steam.

The geothermal resource in the U.S. is large enough to power 20 million KW of electrical generating capacity by the year 2000. That is the equivalent of 700,000 b/d of crude oil, or about 8.5 percent of current U.S. oil output.

Presently, the Geysers geothermal field yields approximately 1,000,000 KW of electrical generating capacity. Predictions are that full development of the field will produce about 2 million KW of generating capacity by the end of the decade. Another development program is underway to develop the geothermal resources in the Imperial Valley.

Environmental impacts from the development of geothermal resources can vary depending upon the pre- and post-lease exploration and development activities, and the nature of the geothermal find. The amount of land used and altered ranges from zero in the very earliest stages of exploration to many tens of acres in a field which has undergone full scale development. Surface disturbing activities are generally, 1) road building, 2) drill pad, low lines or facility site construction, and 3) construction and clearance of pipeline and other transmission line easement.

Steam and/or water can accidentally be discharged. Effluents released can consist of steam and/or hot water with dissolved salts and possibly noncondensible gases such as hydrogen sulfide, carbon dioxide, or ammonia. The accidental release of the toxic gases and water would result in air, water and noise pollution.

Subsidence and seismic activities may be accentuated during the production phase. The potential for subsidence is greatest in hot water systems produced from unconsolidated sediments (i.e., Imperial Valley). Since the majority of geothermal systems are in more competent rock they are not subjected to subsidence.

Geothermal systems are often found in areas of seismic activity. Possible fault movement can result from the removal and reinjection of fluids causing cyclic variations in reservoir pressures.

5. Synthetic Fuels: The synthetic fuel development has slowed down due to the sagging price of crude oil due to the world surplus. Oil

price moderation, soaring costs, and lack of Federal assistance has led operators throughout the U.S. to shelve, delay or abandon commercial synfuel ventures. Some operators have kept their projects in order to alleviate future depression of fossil fuels.

a. Coal Gasification: Coal gasification seems to be the leading commercial scale synfuel projects throughout the world. A National Coal Association survey revealed that, in the United States, 30 coal-to-syngas projects were in operation in 1981. Of these, only eight are commercial operations. The remainder are demonstration, pilot, or process development units.

b. Coal Liquefaction: The only truly commercial synfuel production is the coal liquids produced at South Africa's Sasol plants. These three facilities convert coal mined on site into 27 different fuel and chemical products. The combined coal consumption of all three plants will be about 33 million metric tons/yr. It is predicted Sasol Ltd. could produce sufficient quantities of hydrocarbons to make South Africa self sufficient (E&MJ, November, 1982).

Environmental impacts from the development of coal liquefaction would be similar to those for mining coal (see Section II.C.2). Additional impacts would result from the coal liquefaction facility.

6. Oil Shale: Large areas of the United States are known to contain oil shale deposits with those in the Green River formation in Colorado, Wyoming, and Utah having the greatest commercial potential. The oil shale resources of the Green River formation are estimated at 54 billion bbl of recoverable oil with an assay of 30 gal/ton and 600 billon bbl of reserves in place from shale with an assay exceeding 25 gal/ton. Therefore, the Green River formation represents 20-30 times the known reserves of conventional crude oil in the U.S.

Oil shale development poses serious environmental problems. With surface or conventional underground mining, it is very difficult to dispose of the huge quantities of spent shale, which occupy a larger volume than before the oil was extracted. Inducing revegetation in an area of oil shale development is difficult and may take more than 10 years. In-place processing avoids many of these environmental hazards. The spent shale problem is much less severe with underground processing.

However, the processing (retorting) operations consume large quantities of water and generate large amounts of wastewater. The wastewater must be treated and can be reused in the processes. It has been assumed that water pollution will not be a problem outside the complex. However, the limited availability of input water in the development area will lead to resource use conflicts.

Oil shale can be used in two main ways as an alternative energy source for the production from the proposed sale. The first is the retorting of the shale to produce oil, and the other is directly using the shale as a solid fuel, which is being done both in the Soviet Union and China (Deines and Shabad, 1979). Direct burning is inefficient and will result in large accumulation of waste and ashes adjacent to the power stations.

7. Hydroelectric Power: Hydropower is energy from falling water, which is used to drive turbines and thus produce electricity. Conventional hydroelectric developments convert the energy of natural regulated stream flows falling from a height to produce electric power. Pumped storage projects generate electric power by releasing water from an upper to a lower storage pool and then pumping the water back to the upper pool for repeated use. A pumped storage project consumes more energy than it generates but converts offpeak, low value energy to high value peak energy.

Many of the major hydroelectric sites operating today were developed in the early 1950's. Thirty to forty years ago hydroelectric plants supplied as much as 30 percent of the electricity produced in the United States. Although hydroplant production has steadily increased, thermal-electric plant production has increased at a faster rate.

The undeveloped potential for hydroelectric generation is about 93,000 MW in the lower 48 states and about 32,000 MW in Alaska. However, it is likely that hydroelectric power will continue to represent a declining percentage of the total U.S. energy mix due to high capital costs, seasonal variations in waterflows, land use conflicts, environmental effects, water use, and flood control constraints. Sites with the greatest production capacity and lowest development costs have already been exploited.

Construction of a hydroelectric dam represents an irreversible commitment of the land resource beneath the dam and lake. Flooding eliminates wildlife habitat and prevents other uses such as agriculture, mining, and free-flowing river recreation. This is an economic cost which can greatly exceed the cost of the dam itself as was seen by one small hydroelectric facility in Pennsylvania which cost $15 million in 1971 for the dam, but relocation and property adjustment costs added $100 million to the cost of the project. This does not include the lost value of the wildlife habitat, the crops which would have grown, or the recreational activity in the natural environment. However, recreation will continue in the form of boating after the facility is completed.

8. Solar Energy: Applications of solar energy must take into account the following:

1) Solar energy is a diffuse, low intensity source.
2) Its intensity is continuously variable with the time of day, weather, and season.
3) Its availability differs widely between geographic areas.

The total solar energy intercepted by the earth is 5.9×10^{17} Btu per hour. This is reduced by the atmosphere to approximately 2.7×10^{17} Btu per hour which gives an average intensity of 1,450 Btu per square foot per day. This energy, although free, requires conversion to a suitable form. The major constraint on conversion is the size of the collector required, due to the low efficiency of existing collectors.

Photovoltaic collectors are presently precluded by the large required collector area and the high cost per unit area. A 1980 study by Jet Propulsion

Laboratories shows that 52.7 percent of the electricity consumed in the San Fernando Valley could be produced by utilizing half of flat or south facing roofs in the area for photovoltaic collection. However, the unit cost of photovoltaic cells makes this type of project uneconomical.

Another method of utilizing solar power is solar thermal, where the sun's rays are directed by mirrors to a central point, and are then capable of being used as the heating source for a thermal power plant. Southern California Edison is using this concept in their experimental solar plant near Barstow. This plant came on line in 1982, and has an output of 10 megawatts.

Another use of the reflected mirror system is as a solar furnace. A large scale furnace capable of producing temperatures up to 6000°F has been in operation near Odeillo in Southern France since 1969.

Currently, the most prevalent use of solar power, both in active and passive systems, is in space and water heating in residential and commercial buildings. The use of solar power is not a new idea, as man has used the sun's energy to heat his homes since prehistoric times. In 1897, 30 percent of the homes in Pasadena were utilizing solar-water heaters, and by 1941, at least 40,000 solar water heaters had been installed in Florida.

The first "modern" solar house in the U.S. was built in 1938 at MIT. Although at first there was little real interest in solar power, interest has increased tremendously over the past few years. In 1976, thirty-seven states passed solar incentive legislation. Since then, several cities and local jurisdictions have enacted various solar ordinances. Los Alamos prohibited the erection of buildings that would shadow an existing solar collector between 9 a.m. and 4 p.m., and San Diego requires all new residential buildings to use solar heating systems.

Many homeowners are converting their homes over to solar power due to the conservation and the tax incentives for both State and Federal governments. Not all homeowners can take advantage of this, as only 65 percent of existing residential units can be retrofitted with solar space and/or water heating systems.

Solar energy also includes wind energy and ocean thermal energy. Wind power has been used by man for centuries, first as a means of propulsion for boats and ships, and later as a pump source for irrigation and drainage of lands. Later still, windmills were used for grinding grain and powering sawmills. Prior to 1900, windmills were being used as a source of generating electric power. Since the mid 1970's, several wind power systems have been installed in the U.S. These have included a 2 Mw system near Boone, North Carolina, and 200 Kw turbines at Clayton, New Mexico, and in Rhode Island and Hawaii. A wind farm has been installed near San Francisco, and a test facility has been set up near Palm Springs.

Ocean thermal energy is still in the experimental development stage, although the Department of Energy estimates that by the year 2000 ocean thermal energy conversion could replace 400,000 barrels of oil a day, equivalent to a power generation of 93 MWe. This system has been successfully tested on a small scale off Hawaii with a 10 MWe plant.

9. Bioconversion: Bioconversion is the process of transforming biomass into usable energy. Three methods of conversion are: 1) the conversion into liquid form (alcohol), 2) the conversion of organic waste into methane gas by bacterial breakdown of the biomass, and 3) the direct burning of source.

The first method mentioned is the conversion of organic matter into a liquid form, primarily alcohol. This can either be mixed with gasoline to produce gasohol, a product already in widespread use, or the alcohol can be burned directly in the vehicles. Brazil has replaced 20 percent of its gasoline with alcohol derived from plant matter.

The second method, the use of bacteria, is already in use on small scale in the U.S. An example is the Hyperion Sewage Treatment Plant in Los Angeles which uses produced methane to run the plant, and sells the excess to a municipal electrical generating plant.

10. Energy Conservation: Vigorous energy conservation is an alternative that warrants serious consideration. The Project Independence Report of the Federal Energy Administration claims that energy conservation alone can reduce energy demand growth by 0.7 and 1.2 percent depending on the world price of oil.

The residential and commercial sectors of the economy are often characterized as inefficient energy consumers. Excessive consumption is also evident in the industrial sector. Estimated energy savings of between 10 and 30 percent may be available in these sectors of the economy through conservation. This could be by such means as insulation of buildings, installing more efficient heating units, and by utilizing the smallest amount of power to perform industrial functions.

Transportation of people and goods accounts for approximately 25 percent of nationwide energy use. Using short- and mid-term conservation measures such as consumer education, lower speed limits, rate and service improvements on public transit, and rail freight transit, energy savings of 15 to 25 percent might be achieved.

Significant energy savings are clearly possible through accelerated conservation efforts. The Project Independence Report estimates that conservation alone could result in a 2.2 million barrel per day reduction in petroleum demand by 1985. The environmental impacts of a vigorous energy conservation program will be primarily beneficial. The exact nature and magnitude of these impacts will depend on whether there is a net reduction in energy use or whether the reduction is accomplished through technological change and substitutions.

AFFECTED ENVIRONMENT

III.

CHAPTER III

III. AFFECTED ENVIRONMENT

A. Physical Environment

1. Geologic Description: Central California, in late Cretaceous time, was dominated by intense faulting, volcanism, and marine to nonmarine conditions associated with the interaction of plate boundaries. Available geologic information indicates that the Farallon Plate, which lay between the obliquely converging North American and Pacific Plates, was being subducted along the western margin of the North American Plate. Following the contact of the North American and Pacific Plates, subduction was replaced by right-lateral strike-slip faulting (Atwater, 1970) along the San Andreas and associated faults that persists as far north as Cape Mendocino. Presently, north of Cape Mendocino, the Gorda Juan de Fuca Plate is being subducted.

Granitic and metamorphic basement rocks of the Salinian block (Reed, 1933; Page, 1970) underlie northwest-trending Salinian province onshore, and are thought to extend offshore to form the basement beneath the central third of the central-northern California shelf. The Salinian block is separated from the block on the east by the San Andreas fault, and from the Nacimiento block on the west by the Sur-Nacimiento fault. Ross (1978) suggested that the Salinian block is an allochthon surrounded, and probably underlain by Franciscan rocks (Ross and McCulloch, 1979). As a result of its position between two major plates, right-lateral shear forces on the Salinian block have produced considerable internal strike-slip faulting.

North and south of the Salinian block, the shelf is considered to be underlain by the Franciscan assemblage (Jurassic, Cretaceous, and early Tertiary marine metasediments). Indications are that these marine sediments were once deeply buried, and extensive erosion occurred in the late Cretaceous or early Tertiary time (Hoskins and Griffiths, 1971). Subsequent marine sedimentation proceeded through early Tertiary time, but renewed deformation and erosion left only remnants of the lower Tertiary deposits. Shelf-wide marine transgression then occurred and these deposits covered most of the present continental shelf and, in places, part of the adjacent slope.

Deformation through the mid-Tertiary was related to subduction; however, in upper mid-Miocene time, a change in tectonic forces initiated the formation of the continental shelf and the present shelf basins. Basement ridges were generally uplifted along the outer margins of the shelf (Curray, 1966) to form the seaward margins of the shallow basins. The shelf basins more or less acted continuously as sites of deposition for marine sedimentation until late Pliocene time. Most basins contain down-to-basin normal or high-angle, reverse faults along their eastern margins, and exhibit late Tertiary or Quaternary compressional folding.

<u>Santa Maria Basin.</u> Santa Maria Basin measures approximately 40 km long x <u>230 km wide and is</u> elongate parallel to the coast from Point Conception to Point Sur. It is bounded on the northwest by Franciscan basement rocks that have been elevated along major coastal faults, and on the southwest by the Santa Lucia Bank. The northwest end of the basin continues onto the continental slope. The basin shallows to the south as it approaches the western

end of the Transverse Ranges, but continues south and east to join the western end of the Santa Barbara Basin of the Transverse Range Province. The basin truncates the western end of the Transverse Ranges (McCulloch, et al., in press).

The relatively shallow Santa Lucia Bank is formed by the Santa Lucia structural high, which is bounded on the east by the Santa Lucia Bank Fault. Vertical separation on the Santa Lucia Bank was accompanied by considerable strike-slip displacement.

Structural trends (fold axes and faults) in the northern two-thirds of the basin parallel the shoreline. The structures generally appear to have been initiated by early Tertiary time, and most persisted into late Miocene time. The associated faulting and deformation is considerably less extensive above the early Tertiary unconformity. Just south of Point Sur there is evidence for present day compression and thrusting of the basin sediments that lie adjacent to the fault that bounds the northeast edge of the basin (McCulloch, et al., in press). Structural trends in the southern third of the basin are north-south (Hoskins and Griffiths, 1971). Considerable evidence for compression is also present in this area. Low-angle thrusting, with a vergenz to the west started by at least early Tertiary time, and appears to have continued through Tertiary and Quaternary time.

2. Geologic Hazards: Geologic hazards in parts of central and northern California shelf basins have been previously described by McCulloch, et al., (1980), Field, et al., (1980), Richmond, et al., (1981), and McCulloch (1982). Although these hazards studies were of limited areas, they help to describe the kind of hazards that may occur elsewhere on the entire California shelf. However, to adequately define the geologic hazards in other portions of the area, additional surveys and fieldwork need to be performed.

The Geologic Hazards Graphic No. 3 is a composite of maps contained in reports by McCulloch, et al., (1980), Field, et al., (1980), and McCulloch, (1982). This visual provides a regional scale representation of the geologic hazards for those portions of central-northern California for which there are publicly available data. Instability of the sea floor, whether from seismic activity or sedimentary processes, is recognized as the principal hazard to emplacement of platforms and pipelines in the marine environment. Hazards related directly to seismic activity include ground shaking, fault rupture, generation of tsunamis, and earthquake-induced ground failures such as liquefaction and slumping. Recent analysis of earthquake strong motion records (Joyner and Boore, 1981) have shown not only that accelerations in excess of the force of gravity can accompany large earthquakes, but that these high accelerations persist with little diminution for several kilometers away from the fault.

Faults showing displacement of either the sea floor or young (less than 11,000 years) sediments as well as those associated with historical earthquakes are considered active and therefore potentially hazardous to development of petroleum resources. The major seismically active faults (refer to Geologic Structure Graphic No. 2) that bound the offshore geologic basins have either produced large earthquakes (1906, 1927), or on the basis of mapped length, appear to be capable of producing earthquakes larger than magnitude 7.

A large earthquake may have considerable effect on the stability of unconsolidated sediment on the shelf and slope. Based upon studies of onshore ground failures that have accompanied large earthquakes, considerable mobilization of offshore unconsolidated sediment may be expected to accompany seismic activity. Mobilization will be accompanied by downslope movement, even on gentle slopes (less than 5°), movement toward local topographic lows, such as sea floor drainage ways, and a loss of bearing strength. This earthquake-induced behavior of unconsolidated sediment was observed onshore in many areas as a result of the 1906 San Andreas earthquake (Youd and Hoose, 1978). This type of soil failure caused considerable damage to modern buildings, roads and bridges over a wide area in the 1964 Alaskan earthquake (Kachadoorian, 1968; McCulloch and Bonilla, 1970). It should be emphasized that earthquake -generated slope failures and lateral displacements were common even on very gentle slopes (0.25°). Thus similar failures might be expected on the continental shelf as well as on the more steeply sloping continental slope (Field, et al., 1982).

Instability of the sea floor can also result from dynamic (e.g., wave surge) and static (e.g., gravity) forces acting independently of seismic activity. Some areas of the sea floor are prone to mass movement (e.g., slumps, slides) or other forms of sediment transport (flows, creep, or current scour).

Oil and gas seeps, while not inherently hazardous, may provide clues to the location of fractured reservoir rocks and shallow over-pressured gas pockets that can pose a danger to drilling operations if not anticipated and properly planned for. The occurrence of gas increases chances for blowouts, which are considered to be the most costly and feared operational hazards related to oil and gas operations (Danenberger, 1980). Gas may decrease soil strength, and careful consideration must be given to gas content when designing foundations for bottom founded structures.

Geologic hazards in the Santa Maria Basin are shallow gas and gas-charged sediments, shallow slope failures, steep slopes, potential fault rupture of the sea floor, and relatively strong seismic shaking.

High-amplitude seismic reflections (bright spots) indicate possible accumulations of gas near tops of anticlines in the Neogene rocks. The gas appears to be migrating upward in these structure and up dip toward shore.

Shallow slope failures (tens of meters of unconsolidated sediments) have occurred on gentle slopes (less than 2°) at water depths greater than 300 m. Indications are that the mass transport may have resulted from a loss of soil strength due to seismic shaking. Failures also occur in areas of gas-charged sediments, which may have contributed to the failure by decreasing soil strength.

Steep-walled submarine channels, which comprise the upper reaches of the Arguello Canyon system, incise the continental shelf and slope of southern Santa Maria Basin. Unconsolidated sediments floor all of these channels and form at least a thin skin on the channel walls. Steep wall slopes, greater than 10°, are common in all of the channels. Several subparallel, southwest-trending buried channels are associated with the modern sea-floor channels.

The Santa Maria Basin is bounded on the east and west by relatively long (greater than 100 km) seismically active faults. The eastern side is bounded by the Hosgri fault thought to have produced the M.7.3 Lompoc earthquake in 1927 (Gawthrop, 1975). Profiles across the Hosgri fault zone (Wagner, 1974) show considerable vertical separation, along with presumed Franciscan basement rocks have been uplifted to near the surface. The displacement history of the fault zone is controversial.

Recent epicenter determinations show that the Hosgri fault is presently seismically active (McCulloch, 1982). It has been suggested that the Hosgri fault and the San Gregorio fault to the north are part of a major strike-slip fault system that joins the San Andreas fault in the Gulf of the Farallones (Greene, et all, 1973; Graham, 1976). Studies that relate fault length to potential earthquake magnitude (e.g. Bonilla, 1967) indicate that such a fault would be capable of producing earthquakes in excess of magnitude 7. Thus there may be the potential for a large earthquake along the eastern side of the offshore Santa Maria Basin and the eastern side of the Gulf of the Farallones.

In the southern half of the offshore Santa Maria Basin, there is seismic activity associated with relatively straight north-northwest-trending faults on, and adjacent to, Santa Lucia Bank. The most continuous fault, the Santa Lucia Bank fault, appears to be largely a right-lateral slip fault along which there was significant displacement until at least late Tertiary time (McCulloch, et al., 1980; Page, et al., 1979). First-motion solutions for several seismic events suggest that the recent displacement is by thrusting. The sea floor is offset along some of the faults on Santa Lucia Bank, as it is along several faults on the western edge of the northern part of the basin. The sea floor offset may be due in part to recent movement and in part to the preservation of old offsets in an area where recent sedimentation is low.

The Santa Maria Basin is adjacent to several seismically active faults and can be expected to experience seismically-induced ground motion. Expected seismically-induced ground motion for this area is between 0.1g and 0.2g for a 100-year return and about 0.6g for a 2,500-year return (Thenhaus, et al., 1980).

Strong seismic shaking can be expected in the eastern part of the basin associated with the Hosgri fault. Seismic activity associated with faults along the western edge of the basin is largely confined to the southern part of the basin where the faults are relatively straight, and largely excluded from the northern area where the structures associated with faulting appear to have been refolded.

3. Non-Petroleum Mineral Resources: Many varieties of non-petroleum resources are located in the ocean and on or beneath the ocean floor. Contained on the California continental margin are vast quantities of sand and gravel, associated heavy mineral deposits and phosphorite. There is an increased interest in these deposits due to 1) increasing shortages of the resources; 2) the expanding need for new sources of these minerals to reduce the pressure on existing supplies and, in certain instances, to lessen the environmental impacts of surface mining; 3) to reduce the United States dependency on foreign sources; 4) the availability of economically and technologically feasible offshore recovery systems.

The most exploitable of these resources along the California Coast are the beach and nearshore deposits of sand and gravel. These deposits are derived from three principal sources: sand dunes, glacial deposits of Pleistocene age, and sediments which have been transported to the coast by streams and rivers. Sand and gravel have a wide variety of uses. Traditionally, they have been used as construction aggregate, ballast, fill, and possibly for beach replenishment or restoration. However, depending upon the physical and chemical properties, the sand can be used for the manufacturing of glass and ceramics, as well as for filtration and grinding. Extending from south of Monterey Bay to Point Conception, the most extensive gravel deposits (west of Big Sur) cover an area of a quarter square kilometer. The coarse sand deposits which are present in this area each have an average coverage of about a quarter to a half square kilometer. The most prolific sedimentary deposits in this area, south of Monterey Bay, are the sand deposits. These deposits, which appear to be deltaic progradation existing in a high energy regime, each cover an average area of approximately 2 km^2 and are found west of Big Sur, Santa Maria, and Lompoc.

Associated with sand and gravel are placer deposits. These deposits are superficial mineral deposits formed by the mechanical concentration of mineral particles weathered from various sources. Marine placers usually contain concentrations of heavy and chemically resistant minerals; the most abundant of these minerals found in California waters is magnetite and ilmenite. Less abundant but associated with black sands, are gold, and the platinum group metals, tin, inert oxides, and silicates (i.e., chromite, garnet, rutile). Relatively insoluble sulfides such as cinnabar have also been recovered in small amounts. Although rare, there have been reported occurrences of zircon heavy mineral concentrations at Point Sal.

Authigenic phosphorite is a phosphorus-rich rock which is an important marine mineral that may prove to be economically valuable in the near future. Phosphorus is one of the major nutrients needed for plant life processes. Phosphorite found in the marine environments occurs in several forms as nodules, as phosphate sands and muds, and as beds of consolidated sediments in consolidated rock. The waters offshore from San Luis Obispo to Point Conception are characterized by upwelling and may be associated with phosphorite authigenesis.

Wilson and Mero (1966) indicate that phosphorite deposits are known to extend from coastal waters off Point Reyes north of San Francisco, southward 10,000 km to the mouth of the Gulf of California. Many of the known deposits are found south of Point Conception. Phosphorite nodules found along the California Coast may occur in some places within a few kilometers off the coast and extend as far from shore as the inner edge of the continental slope. The water depth at which phosphorite exists ranges from 30 m to 2,500 m. Since the origin of phosphorite may be associated with upwelling, we may extrapolate tentatively existing upwelling data as an indication of potential sites for submarine phosphorite formation, Figure III.A.4-1.

Glauconite is an authigenic sea-floor mineral of potential economic interest that is found in widespread occurrence off the Coast of California. This mineral contains from 2-9% K_2O and could serve as a future source of potash and soil conditioner for agricultural use, or as a source of potassium or potassium salts. Compared to continental deposits of potash salts, marine glauconite sediments could not be considered a rich source of supply; however mining costs would be relatively cheap and mechanical concentration might possibly produce a product with a significant amount of contained potash. Glauconite is widely distributed in the terrigenous sediments off the coast of the state, occurring in water depths ranging from 200 to 400 m. The highest concentrations of glauconite occur in environments in which detrital sedimentation is slow or virtually absent, such as banks, ridges, and upper slopes of basins of the continental shelf. Distribution of the mineral is normally patchy both laterally and vertically.

4. Physical Oceanography: This section briefly summarizes the physical and chemical characteristics and some oceanographic forces found off Central California. For a more complete review of Central California physical and chemical oceanography, see Winzler and Kelly (1977), Hickey (1978), and Williams (1981). Additional data will be forthcoming form the CODE and SuperCODE projects funded by NSF and the study of circulation funded by the MMS.

Oceanic Water Circulation and Water Mass Characterization. The ocean water adjacent to the California Coast is basically characterized by the southern flowing subarctic water of the California Current. The water mass of the California Current is modified by a deep (200 m) undercurrent that flows northwest from Baja California to north of Cape Mendocino. Additionally, the circulation pattern and water characteristic structure along the Central California Coast fluctuate due to seasonal climatic changes.

The three distinct seasons or periods along the Central California Coast are: the oceanic period (July until the middle of November); the Davidson Current period (mid November until the middle of February); and the upwelling period (mid February until the end of August).

The Oceanic Period is the season when the California Current dominates the circulation pattern. The California Current is best described as a meandering, diffuse, southeastward flow, with short-term variations in speed. The average speed has been reported to be between 10 and 25 cm/sec, while the maximum speed has attained speeds of 50 cm/sec (Schwartzlose and Reid, 1972). Although there is no true western edge to the California Current, it has been reported to extend 600 to 1,000 km offshore, and is found in the upper 100 to 500 m. The southward flowing California Current transports low-temperature, low-salinity, high nutrient (high uM phosphate) and highly oxygenated (7.8 ml O_2/l) subarctic water (Wyllie and Lynn, 1971; Thomas and Seibert, 1974; CalCOFI, 1964; Emery, 1960).

The Davidson Countercurrent, which appears nearshore during the Davidson period, may be the surface expression of the northward flowing Equatorial water undercurrent. The Davidson Current develops in the winter when the winds are northward along the California Coast. The Davidson Current lies landward of the California Current and extends to approximately 80 km offshore with speeds measured between 16 and 47 cm/sec (Schwartzlose and Reid, 1972; Schwartzlose, 1963). The characteristics of the deep flowing Equatorial Pacific water that emerges to from the Davidson Current are warm, high-salinity, nutrient-rich (high uM phosphate), and oxygen poor (to F0.25 ml O_2/l) (Wyllie and Lynn, 1971; Thomas and Seibert, 1974; Emery, 1960).

Coastal upwelling, present during the upwelling period, is part of a large scale oceanic process that takes place along the western edge of continents.

As the wind blows parallel to the coast in the direction of the current, surface layers of the ocean surface are transported offshore, and the deeper water moves to the surface (upwelling) replacing the water moved off shore. The upwelled water is usually low temperature, high salinity, and most importantly, nutrient-rich; high in nitrates, phosphates, and silicates essential for high phytoplankton production in the surface layers of the ocean. The upwelling process, thus, acts as a conveyor of nutrients from the depths (generally less than 200 m in California), reviewing the surface water and helping to bring about large phytoplankton blooms, rich zooplankton production and abundant fisheries production. Figure III.A.4-1 shows major areas of persistent upwelling along the Central California Coast. The figure is only approximate and the degree of persistent upwelling which occurs in proposed lease tracts is not known.

Nearshore current data for most of the Central California coastline are lacking.

Surface currents in Central California are primarily wind driven, leading to seasonal variability in patterns. Patterns noted are based on rather short-term studies in most cases or derived from a synthesis of observations from a variety of techniques. The numbers of observations are not equal for all methods employed and not equal among areas or among oceanic periods.

The few archived drifter studies show a complex pattern of surface circulation along the Central California Coast, and because of limited numbers of releases, very little statistical reliability may be attributed to the patterns indicated. Depending on the timing of drifter release and place of release, the trajectories may go into, out of, or north of Monterey Bay or into or north of San Francisco Bay.

The long-term mean (13 years) temperature and salinity distribution from Lynn (1967) shows the influence of the currents and upwelling along the California Coast. The mean temperature, at 10 m, ranges from 10°C near Cape Mendocino to 14°C near Pt. Conception. The isotherms tend to parallel the coast along Central California, with the colder water inshore. The colder water is a mixture of cold subarctic waters from the northern, and the cold water upwelled along the coast.

The long-term mean salinity (Lynn 1967) ranges from less than 33.0°/oo (parts per thousand) near Cape Mendocino, to about 33.5°/oo offshore Pt. Conception. Ocean waters increase in salinity moving from north to south, and are slightly more saline close to shore.

Oceanographic Physical Forces. Along the California Coast, storm surges (increase in general ocean height) are generated by weak tropical storms and by extratropical storms. For California, storm surges are relatively small with elevation of approximately 1 to 3 feet. Extreme examples of storm surge are found along the Mississippi Coast where the surge has been approximately 25 feet.

Typical waves are those generated by storms with wind speeds which occur reasonably often but not by infrequent very severe extratropical storms. Typical wave conditions determine the planning for much offshore activity and, therefore, represent wave conditions most likely to be encountered during

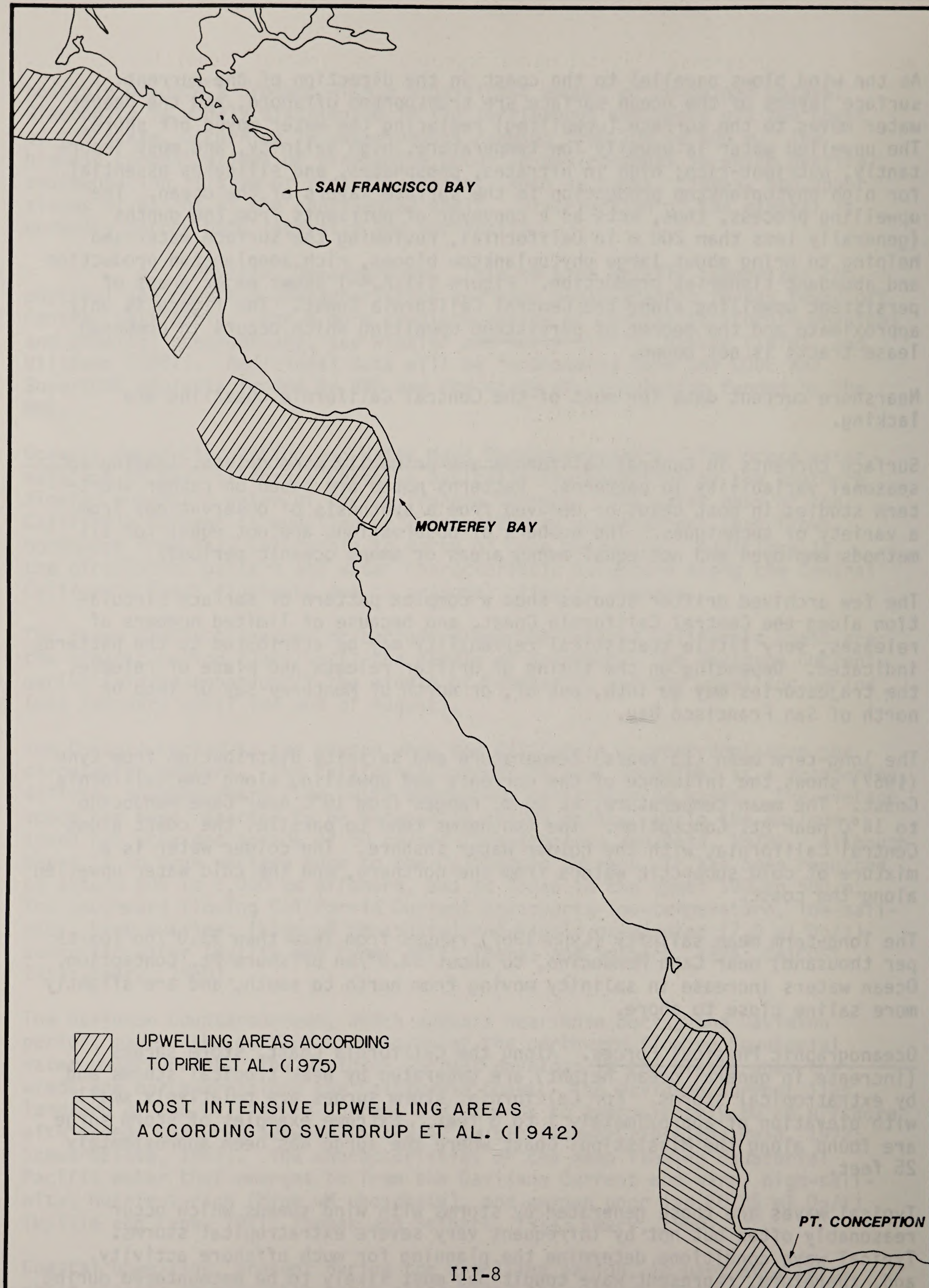

FIGURE III.A.4-1 MAJOR UPWELLING AREAS DURING UPWELLING SEASON (FEBRUARY - JULY).

actual OCS operations. Typical waves represent an "average" condition for a given area. Data for typical waves was generated by hindcast methods for the period 1951 to 1974 by the U.S. Navy Fleet Numerical Weather Central (FNWC). Table III.A.4-1 gives the annual persistence of significant wave heights at three stations offshore California. Significant wave height is an average of the one-third highest waves in a wave record. Wave heights may be greatly increased by refraction. Although no data for the specific lease sale area are presented here, one may extrapolate from the trend of significant wave height duration to decrease as one moves south along the coast. For example, significant wave heights over 6m last 1.3 days at Crescent City but only 1.0 days at San Francisco. The duration would probably be less than 1 day on the sale area.

Wave statistics for the ten most severe storms affecting three selected stations offshore central-northern California, during the period 1951 through 1960, have been obtained by hindcast methods (National Marine Consultants, 1960). Table III.A.4-2 summarized the wave height data. Refraction of waves by the topographic features can result in localized concentration of wave energy with heights considerably in excess of those indicated in Table III.A.4-2. As for the duration of large waves (see paragraph preceding), the significant wave height for severe storms also decreases as one moves south along the coast. Again no data are presented for the proposed sale area but the significant wave height would probably be less than 20 ft. of Pismo Beach.

The data from the MMS funded Pacific OCS Meteorological Data Buoy Network show only a few occurrences of waves greater than five (5) meters during 1982. The buoy off Pt. Sal (46011) experienced five meter or larger waves only five times (maximum wave height 7.4 m), the buoy off Santa Cruz experienced five meter waves only seven (7) times (maximum wave height 7.4m), and the buoy in the Bodega Basin area experienced five meter waves eight (8) times (maximum wave height 7.1m). These are the largest waves recorded and not the third largest average or significant wave height.

Tsunamis or seismic sea waves are gravity waves which are associated with seismic disturbances. Tsunamis, of noticeable size in deep water (approximately 1 m), have periods of 8-55 minutes and lengths of 20 to 30 miles. Areas of highest seismic activity, which could potentially generate a tsunami, are the Aleutian trench area, the Gulf of Alaska, and the Kamchatka Peninsula. California Division of Mines and Geology have shown that damage from a tsunamis in California has almost always been greatest at Crescent City in Del Norte County, regardless of points of origin. The Division of Mines and Geology predict that Tsunamis from distant sources will arrive on the average once every 20 years. Along most of the central-northern California Coast there is a moderate potential, with a high recurrence rate, for damage from high water and swift current resulting from tsunamis.

5. Chemical Oceanography: Chemical oceanography of the Proposed Sale No. 73 area is discussed briefly below. Detailed reviews of the chemical and temperature characteristics of the Central California Coast waters may be found in Winzler and Kelly (1977), Jones and Stokes (1980), U.S. Dept. of the Interior (1978), U.S. Dept. of the Interior (1980), Emery (1960), and the numerous CalCOFI Atlases (1963 to 1979).

TABLE III.A.4-1

ANNUAL PERSISTENCE OF FAVORABLE AND UNFAVORABLE SIGNIFICANT WAVE HEIGHTS

Average Duration (days) for Significant Wave Heights Less Than

	1 meter	3 meters	6 meters
Station 1 Crescent City	3.0	17.5	193.4
Station 3 San Francisco	3.2	29.4	968.7
Station 6 Baja California	2.8	22.8	Approaches infinity

Average Duration (days) for Significant Wave Heights Greater Than

	1 meter	3 meters	6 meters
Station 1 Crescent City	3.9	1.7	1.3
Station 3 San Francisco	3.8	1.4	1.0
Station 6 Baja California	5.9	1.4	Approaches zero

TABLE III.A.4-2

CHARACTERISTICS OF TEN MOST SEVERE STORMS AFFECTING SELECTED STATIONS DURING PERIOD 1951-1960[a]

Station[b]	1	2	3
Storm Date	Largest Significant Wave Height (ft.)		
12-51	26	20	18
12-52	22	20	16
1-53	20	21	20
2-54	23	21	18
3-56	20	20	15
2-58	20	19	18
4-58	20	24	26
11-58	21	21	20
2-59	20	23	20
2-60	32	34	33

[a] From National Marine Consultants, 1960.

[b] Station locations as follows:

Station 1 42.0°N 125.0°W offshore California-Oregon Border
Station 2 39.6°N 124.5°W offshore Ft. Bragg, California
Station 3 37.6°N 123.5°W offshore San Francisco, west of Farallon Islands

Temperature. Ocean temperatures along the California Coast vary with the three main oceanic circulation regimes; Davidson, Upwelling and Oceanic. Lowest temperatures at the surface occur during the Upwelling Season and range from 11°C to 13°C for Central California nearshore waters. Highest surface temperatures occur after the Upwelling Season and range from 14°C to 16°C for Central California nearshore. Offshore and nearshore (within 60 miles) waters differ by only a few degrees. Temperature anomalies (unusually high or low average temperatures) can and do occur in Central California and may persist for 2 years.

Salinity. Salinity of California ocean waters varies only a small degree seasonally and non-seasonal variability predominates. Surface salinity varies from 33.0 parts per thousand in winter and spring along the coast to 33.6 parts per thousand during summer. Salinity varies with depth and water mass along the California Coast and presents a complex pattern.

Oxygen. Surface waters in the California Current are generally saturated down to the thermocline with oxygen which then decreases to an oxygen minimum layer between 700 m and 1,000 m. Below the oxygen minimum layer, there is a gradual increase in oxygen content with depth with the oxygen level of deep waters being relatively constant for hundreds of meters. Oxygen levels vary from surface saturated levels of 7 to 6 ml/l to 0.4 ml/l at the oxygen minimum layer and increasing to 2.6 ml/l at 2000-3000 meters.

Nutrients. The major nutrients characterizing marine waters are phosphate, nitrate, and silicate. These fluctuate with season and depth, the highest surface levels of nutrients being found during the Upwelling Season. Additional sources of nutrients are the major sewage outfalls of urban areas along the coast and areas of agricultural runoff (nutrients from fertilizers). An extensive data base on nutrient levels in California marine waters is contained in the CalCOFI investigations.

Turbidity. Turbidity is measured by Secchi Disk Depths (a light colored disk is lowered until it cannot be seen from the surface and this depth is recorded) and typical values for coastal waters along California are 2 to 10 meters. Open ocean Secchi depths are greater and may be 50 meters. Turbidity increases during spring river runoff when sediments may be carried far out to sea by rivers in Central California.

6. Water Quality: Water quality is defined here as the degree to which chemical concentrations and physical parameters within a water mass approach ambient or natural water conditions. The closer chemical and physical characteristics come to natural conditions the higher the water quality. The following definitions, although somewhat subjective, are used to describe water quality in this document.

High (Pristine) - Normal measures of water quality such as oxygen content, salinity, temperature, transmittance, trace metal concentrations, and hydrocarbon levels show no stable statistically significant changes from ambient conditions.

Good - Some measures of water quality may deviate from ambient measures but return quickly (1-2 days) to ambient.

Poor - Water quality suffers from elevated levels of toxic trace metals or hydrocarbons, neither of which approaches EPA safe levels. Increased levels of these materials may persist for days to weeks.

Very Poor - Water quality is degraded by levels of trace metals, hydrocarbons, sewage, coliform bacteria, or other pollutants which exceed EPA safe levels. Conditions persist for months or longer and may present human health hazards.

Water quality data are sparse for marine waters along the Central California Coast. Miller and McGrew (1977) have summarized existing data and their report should be reviewed for detailed descriptions of water quality. Federal (EPA Water Quality Criteria) and State (California Ocean Plan) regulations and guidelines have been developed to ensure the highest level of water quality This section will briefly describe existing water quality in the Proposed OCS Sale No. 73 area. Some data from outside the proposed sale are but in the central-northern California region are included for illustrative purpose.

Water quality is dependent upon a number of local factors: currents, freshwater inflow, the number and nature of ocean discharges, outfalls, and human activities. Human activities that affect oceanic waters are: discharge of municipal and industrial wastes, cooling water discharges, street surface runoff, accidental oil spillage, dredging, and vessel wastes.

Overall, the oceanic water quality along Central California appears to be very good to high. The exception to the generally high water quality are found in the areas adjacent to centers of population and in some harbors and embayments.

Water quality and source of pollutants for 7 bays and sloughs along the Central California Coast are listed in Table III.A.6-1. San Francisco has particularly poor water quality due to industrial and commercial activity as well as sewage and agricultural effluents. This poor water quality is additionally degrading the quality of adjacent oceanic water. From the data on bays and sloughs along the coast, 50 percent of the sites investigated were found to have degraded water quality in general due to sewage problems.

Determination of water quality along the coast was based upon reliable water column and mussel analyses. The mussel (Mytilus sp.) is used as an indicator of pollution because of the mussel's ability to concentrate pollutants above ambient seawater levels and integrate the pollutant exposure over time. Through the State and national mussel watch program, mussels (Mytilus sp.) from the California Coast were analyzed for selected trace metals (Moss Landing Marine Laboratories) and hydrocarbons (Bodega Bay Marine Laboratory). Stephenson, Martin and Martin (1978) point out that three metals, lead (Pb), silver (Ag), and zinc (Zn), analyzed for in the mussel program, were found to reflect anthropogenic input. The geographical variation of these metal concentrations shows that there is an overall increase in metal concentration toward the south and higher concentrations of metals are found adjacent to centers of high population. Risebrough, R.W., (1978) mussel watch report shows results similar to the trace metal report by Stephenson, Martin, and Martin. Along highly populated coastal areas, hydrocarbons (petrogenic origin) were found to be at increased levels as shown in Table III.A.6-2. In addition to increased hydrocarbon levels that result from anthropogenic activity, increased hydrocarbon levels were found at Goleta where offshore

TABLE III.A.6-1

CENTRAL CALIFORNIA EMBAYMENTS AND SLOUGHS[a] WATER QUALITY

	Location	Water Quality Comment
1.	San Luis Obispo Bay	Good water quality.
2.	Estero and Morro Bay	Elevated coliform concentrations due to stormwater runoff from dairy operations.
3.	Carmel Bay	Good water quality.
4.	Monterey Bay	Water quality in various areas of Monterey Bay is degraded due to discharged sewage effluent.
5.	Moss Landing Harbor/ Elkhorn Slough	Water quality has been degraded (increased BOD coliform) by discharge from dairy operations, treated domestic sewage, and industrial (PG&E power plant and a magnesia refractory) conerns.
6.	Half Moon Bay	No significant water quality problems.
7.	San Francisco Bay	In general, poor water quality is found throughout San Francisco Bay. Water quality problems are due to heavy metals, hydrocarbons, high coliform levels, and depressed dissolved oxygen levels.

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[a] Stephenson, Martin, and Martin, 1978.

TABLE III.A.6-2

MUSSEL (MYTILUS SP.) HYDROCARBON CONCENTRATIONS FROM SELECTED SITES ALONG THE CALIFORNIA COAST

Location	N[b]	Concentration (ug/g Dry Wt.)
So. California Islands	14	12 ± 4
San Diego Harbor	1	220
Los Angeles Harbor	1	270
Goleta	4	440 ± 230
South Shore (Pt. Conception to La Jolla except harbors)	12	64 ± 68
Morro Bay	1	28
Central Coast (excluding Pacific Grove) Pt. Arguello to Farallon Islands	16	9 ± 4
Pacific Grove	2	15 ± 15
Elkhorn Slough	1	49
San Francisco Bay	1	180
Tomales Bay	1	10
Humboldt	3	96 ± 6
Northern California Coast[a]	16	9 ± 4

[a] Point Reyes to Redwood del Norte

[b] N = No. of samples (1 sample = 20 individuals).

Source: Risebrough, personal communication August 1979. (R. W. Risebrough, et al., 1979) oil seeps exist. Trace metal water column samples collected in the surface oceanic waters along the central-northern California Coast were analyzed by Bruland (personal communication, August 1979). These samples, shown in Table III.A.6-3, appear to be relatively clean or unaffected by anthropogenic activities.

In addition to addressing the quality of marine waters offshore Central California, it is useful to consider the geohydrological characteristics of coastal California and the quality of associated groundwater.

At present, a major portion of the water supply of the central coastal area of California comes from local groundwater basins. The sedimentary horizons, in these groundwater basins, often form discrete aquifers. Aquifers in coastal plains may continue offshore and the freshwater they contain could be an integral part of an area's water resource. An example might be groundwater in the Arroyo Grande Area (San Luis Obispo County) which appears to extend offshore beneath the Santa Maria Basin.

7. Ocean Dumping: Ocean dumping has been, and still remains, an accepted means of disposal of waste material from the Coastal States. Off the coast of Central California, there are 29 designated historic and active dump sites. The materials dumped at each of these sites depend upon the type of permit which was issued for that site by the Environmental Protection Agency. The waste materials have consisted of substances such as low level radioactive waste, obsolete munitions, industrial waste, toxic chemicals and dredge spoils.

Low level radioactive waste is comprised of tools, gloves, transport containers, and other articles which have been contaminated. The contaminated material was usually placed in 200 liter (55 gallon) oil drums and completely surrounded with concrete as shown in Figure III.A.7-1 (NAS, 1971). These drums were then dumped into the ocean at the designated sites. The integrity of these containers is not always assured as they have been known to rupture due to the pressure. Of the 59,000 containers dumped at the Farallon Islands between 1966 and 1969, it was estimated that in 1977 as many as 25 percent of the containers may be leaking (Lipshutz, 1981). If a dump site is impacted by OCS activities it could result in an increase of the release of the radionuclides into the marine environment. Low level waste contains on the average less than one curie of activities per cubic foot of material, which allows for "hot spots" where the contamination may be many times the average level (Lipshutz, 1980).

Upon release to the marine environment, radioactivity can progress up through the food chain with the associated bioaccumulation of the radiation. (See Table III.A.7-1). Strontium-90 has been seen in concentrations as high as 65,000 in clam shells, and cesium-137 concentrations in ducks as high as 2,500 times that of their food (Lipshutz, 1980).

Low level radioactive waste has not been disposed at sea since 1970 (Brown 1971, EPA 1980) when disposal by shallow land burial became the accepted means of disposal. The U.S. Navy, however, discharges low level waste from operations of nuclear vessels at sea (NAS, 1971) in accordance with specific Nuclear Regulatory Commission requirements (10 CFR 20.302). The Navy at sea

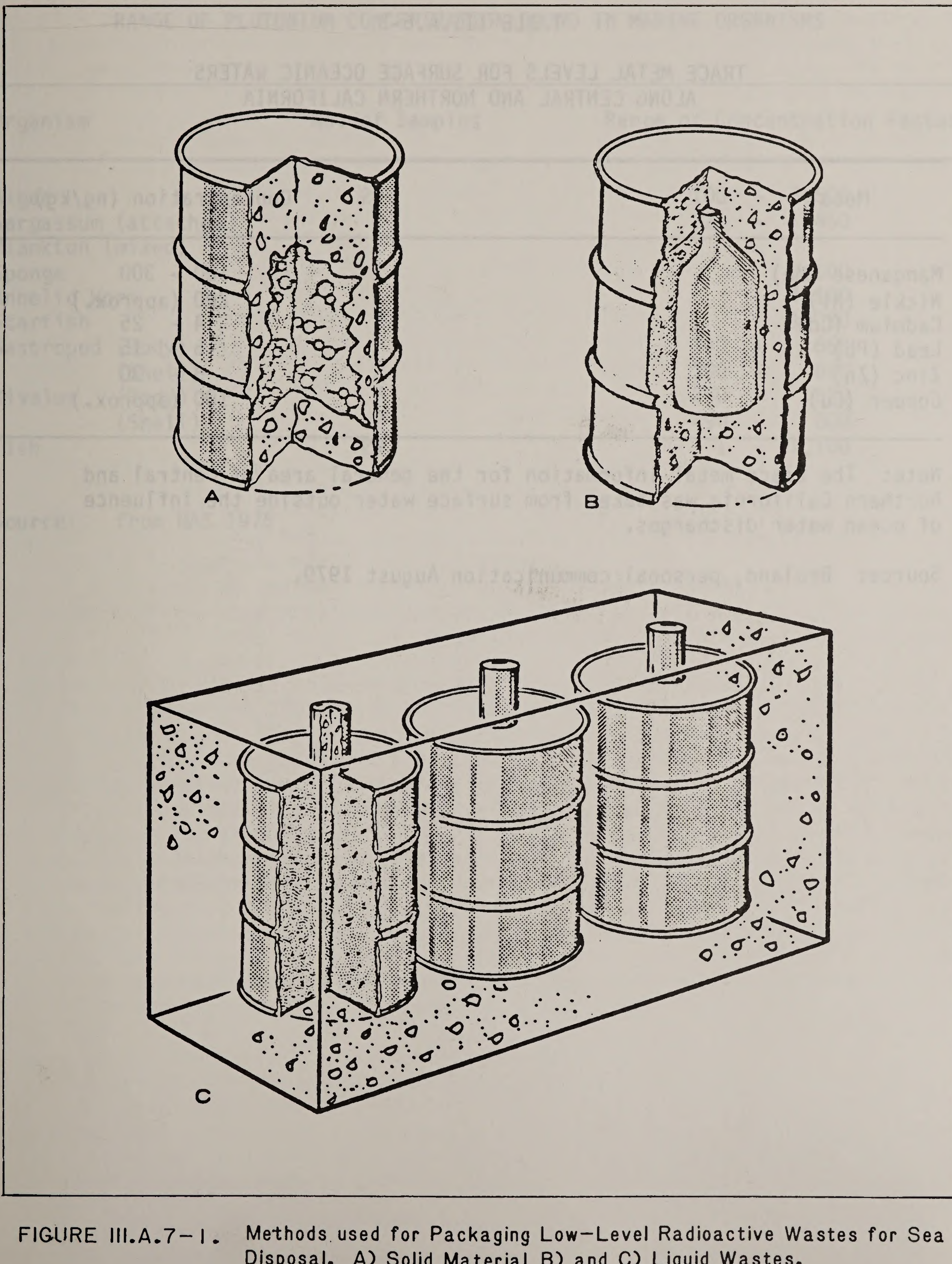

FIGURE III.A.7-1. Methods used for Packaging Low-Level Radioactive Wastes for Sea Disposal. A) Solid Material B) and C) Liquid Wastes. (Source: Pneumo Dynamics Corporation.)

TABLE III.A.6-3

TRACE METAL LEVELS FOR SURFACE OCEANIC WATERS
ALONG CENTRAL AND NORTHERN CALIFORNIA

Metal	Concentration (ng/kg)
Manganese (Mn)	100 - 300
Nickle (Ni)	200 (approx.)
Cadmium (Cd)	4 - 25
Lead (Pb)	5 - 15
Zinc (Zn)	5 - 30
Copper (Cu)	100 (approx.)

Note: The trace metal information for the general area of Central and Northern California was taken from surface water outside the influence of ocean water discharges.

Source: Bruland, personal communication August 1979.

TABLE III.A.7-1

RANGE OF PLUTONIUM CONCENTRATION FOUND IN MARINE ORGANISMS

Organism		No. of Samples	Range of Concentration Factors
Algae		29	100 - 3,500
Sargassum (attached)		2	325 - 450
Plankton (mixed)		2	
Sponge		1	2,100
Annelid Worm		1	4,100
Starfish		1	1,020
Gastropod	(Body)	2	140 - 660
	(Shell)	2	300 - 690
Bivalus	(Body)	7	230 - 520
	(Shell)	2	490 - 600
Fish		29	1 - 1,100

Source: from NAS 1975

discharges are not solid waste and are therefore not subject to impact from the proposal.

In Central California waters, there are 16 active dredge spoil sites. None of these sites are located within the boundary of Proposed Sale No. 73. There are four designated low level radioactive dump sites off Central California, all on the Federal OCS. One designated low level radioactive waste dump site is located 56 nautical miles west of Point Arguello in 2,000 fathoms and covers 1,125 square miles, and the other three sites are situated southwest of the Farallon Islands in 500, 850, and 1,200 fathoms of water, covering a total area in excess of 200 square miles. Of these low level radioactive sites only the Point Arguello site is located in the proposed sale area. Research has shown that no radioactive material was dumped at this site (AEC records). However the site was used by the military for the dumping of explosives and toxic chemical munitions.

In addition, two interim dredge spoil sites are located off Morro Bay (See Figure III.A.7-2). These interim dredge spoil sites were only used once for material which had been dredged from Morro Bay (Belmer, 1983, personal communication). The material which is dredged now from Morro Bay is used to help replenish the beaches in the area.

Future dump sites may be designated as the need for disposal areas increases. In order for an area to be used as a dump site, a permit must be obtained from the EPA. This permit could be a general one, similar to the one issued for dumping mud and drill cuttings from platforms in the Santa Barbara Channel, or it could be site specific for a predetermined volume and type of material. Permitting helps maintain records of the type and location of materials dumped, and preserves the ecological balance in the area by choosing sites where the least damage is expected to occur.

8. Climate and Dispersion Meteorology: The climate of the Central California coastal area is marine in character with cool, dry summers and mild, wet winters. The area is primarily dominated by the North Pacific Subtropical High pressure system. The seasonal variation in the size, location, and intensity of this system accounts for the unique seasonal differences in weather patterns in the area. The Pacific High is most dominant in the summer when it is located to the west and north of California and reaches its greatest intensity and size. Thus dry, stable weather persists all summer. In the fall, the high pressure system weakens and gradually moves southward, thus allowing Pacific storm systems to reach the Coast. Periodic cloudiness and precipitation occurs in winter as the high pressure system is weakest. Occasionally, the weather pattern is broken by a strong high pressure system over the continental U.S. causing warm, windy offshore flow conditions. This occurs primarily in fall and winter and causes the well-known Santa Ana winds in the more southern coastal areas.

Average annual precipitation ranges from 12 inches near Pt. Conception to about 48 inches in the Pt. Sur area. In the coastal areas, precipitation amounts are strongly dependent on nearby topography. Offshore precipitation tends to decrease with distance from the coast. The length of the rainy season increases from south to north. In general, rainfall occurs almost exclusively between November and April.

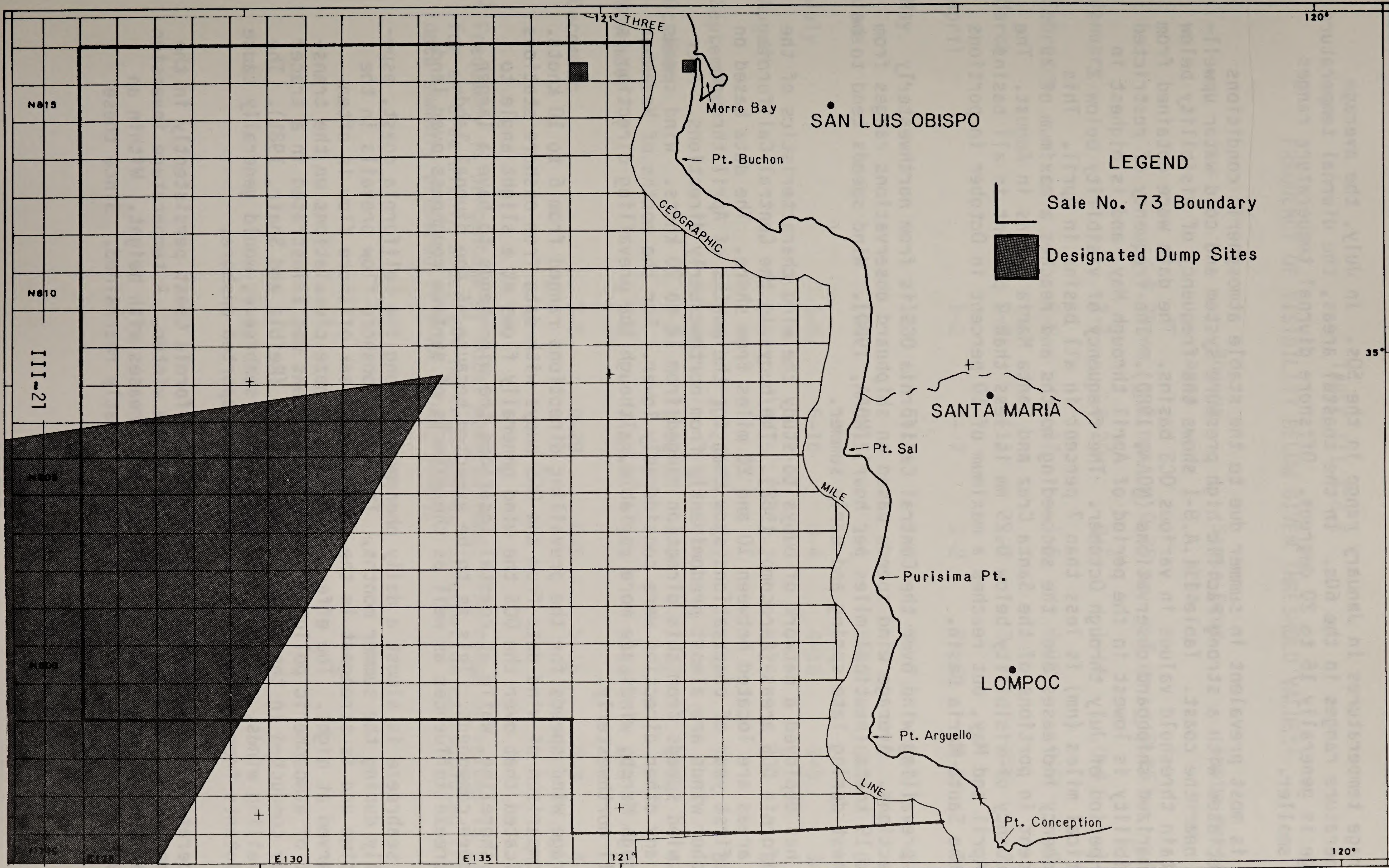

FIGURE III. A.7 – 2 DESIGNATED DUMP SITES OFF CENTRAL CALIFORNIA

Average temperatures in January range in the 50s. In July, the average temperature ranges in the 60s. In the coastal areas, the diurnal temperature range is generally 15 to 20 degrees. Offshore diurnal temperature ranges are smaller.

Fog is most prevalent in summer due to the stable atmospheric conditions associated with a strong Pacific high pressure system and cold water upwelling near the coast. Table III.A.8-1 shows the frequency of visibility below certain threshold values in various OCS basins. The data were obtained from summarized shipboard observations (NOAA, 1980). The frequency of restricted visibility is lowest in the period of April through May, and is highest in the period of July through October. The frequency of visibility below 2 nautical miles (nm) is less than 7 percent in all basins in April. This frequency increases over the succeeding months and reaches a maximum of 25 percent in portions of the Santa Cruz and Santa Maria Basins in August. The frequency of visibility below 0.25 nm is less than 2 percent in all basins in April and May, but reaches a maximum of 10 percent in October in portions of the Santa Maria Basin.

The prevailing wind over the Central California OCS is from northwesterly directions. Average wind speeds based on shipboard observations ranges from 6 to 19 knots (nautical miles per hour) (NOAA, 1980). Wind speeds tend to be highest during late spring and early summer.

MMS has deployed a network of buoys to study the wind characteristics of the California OCS areas (Aerocomp, 1982). The buoys in the Central California OCS areas are located between 10 and 20 miles from shore. The data based on the first year of observations show that for the months of April through October winds are almost predominantly from northwesterly directions. Average wind speeds from this direction ranged from 10 to 20 knots. Wind speeds for any other direction were considerably lower. For the months of November through March, winds are more variable, although the prevailing direction is still northwesterly.

Average wind speeds for the prevailing directions ranged from 6 to 10 knots. A comparison of wind data from the OCS buoys with data from onshore stations indicated that over the OCS the wind generally flows at a slight angle to the shoreline, while at coastal locations the wind tends to have a larger onshore component. This is to be expected because of the diurnal land-seabreeze influences as well as the effects of surface roughness over land.

The seabreeze is almost a daily phenomenon along the California coast, especially during the summer months. Therefore, onshore flow prevails in the daytime and is strongest in the afternoon. Weak offshore flow is often observed at night. The effect of land-seabreeze circulations on the transport of atmospheric pollutants in coastal areas was illustrated in a tracer study conducted in the Santa Barbara Channel (Reible and Shair, 1981). The prevailing winds, combined with the diurnal seabreeze, would generally cause pollutants from offshore sources to be transported onshore.

Temperature inversions exist along the California Coast persistently in the summer, and somewhat less frequently in the winter. A temperature inversion is a layer of air in which temperature increases with height. Within an inversion layer, atmospheric mixing is greatly restrained. Since these

TABLE III.A.8-1

FREQUENCY OF VISIBILITY BELOW GIVEN THRESHOLD VALUES[1]

	Bodega area		Santa Cruz area		Santa Maria area	
	≤ 0.25 nm	≤ 2 nm	≤ 0.25 nm	≤ 2 nm	≤ 0.25 nm	≤ 2 nm
January	2-4	6-20	0-5	1-13	0-4	1-13
February	2-8	6-17	1-5	3-12	0-5	0-12
March	0-2	4-11	1-2	3- 7	0-4	3- 5
April	1-2	4- 7	1-2	2- 6	0-2	0- 6
May	1-2	5-12	1-3	3- 7	0-3	2- 9
June	1-4	6-15	1-4	5-10	0-3	0- 8
July	1-6	6-16	0-4	4-18	1-5	3-14
August	0-4	10-16	2-7	6-25	1-7	3-25
September	2-8	10-25	2-7	6-19	0-4	3-13
October	3-5	11-14	3-9	7-17	1-10	4-17
November	1-6	7-18	1-6	5-14	0-5	4-13
December	3-5	9-29	0-5	5-15	0-9	4-13

[1] Frequency is percentage of total observations. The range of values is given for an area within about 100 nm from shore. Information extrapolated from data summary prepared by NOAA (NOAA, 1980).

TABLE III.A.8-2

RELATIVE ANNUAL FREQUENCY OF ATMOSPHERIC STABILITY

	Pasquill Stability Index					
	A	B	C	D	E	F
Vandenberg, AFB	0.7	7.2	11.9	22.8	26.7	30.7
Point Arguello	0.8	4.1	11.0	27.4	29.9	26.3

Source: NOAA, 1980. Frequency is in percentage of total observations.

TABLE III.A.9-1

CURRENT COMPLIANCE STATUS FOR MAJOR AIR POLLUTANTS

Region	Pollutant				
	O_3	TSP	NO_2	SO_2	CO
South Central Coast Air Basin					
San Luis Obispo County					
Salinas Valley Area	A	S	A	U	A
Other	A	A	A	U	A
Santa Barbara County (AQMA)	P	A	A	U	P
Santa Barbara County (non-AQMA)					
Western Area	P	P	U	U	U
Eastern Area	P	U	U	U	U
Ventura County					
Northern Area	P[1]	U	A	A	A
Southern Area	P	P	A	A	A
Channel Islands	U	U	U	U	U

A - Attainment, better than Federal air quality standards
P - Nonattainment, exceeds primary standards
S - Nonattainment, exceeds secondary standards
U - Unclassifiable, insufficient data exist to make a determination

Note:
[1] Proposed for reclassification to Attainment.

Source: 40 CFR 81.305

inversions along the California Coast are often low level (usually about 300 m or 1,000 feet), pollutants released close to the ground are trapped, leading to potential high concentrations of air contaminants. During summer, cold surface water along the coast causes an inversion layer by cooling the atmosphere immediately above the ocean surface. This inversion layer moves onshore with the daily seabreeze. The inversion weakens as it moves further inland as the air below the inversion warms up.

Atmospheric stability can be described in terms of the Pasquill Stability Index. Stability Index A indicates very unstable conditions with high potential for mixing, while Stability Index F is the most stable, indicating very limited mixing. Table III.A.8-2 shows the observed frequency distribution of atmospheric stability for various onshore stations (NOAA, 1980). These figures are indicative of coastal conditions, but not necessarily of offshore conditions. Available data indicate that slightly stable conditions (Pasquill Stability Class E) tend to prevail over the ocean (Schachen, et al., 1978).

Tracer studies were conducted by BLM in the coastal area near Ventura to characterize overwater dispersion (Aero Vironment, 1981). The results showed that vertical dispersion tended to be less over water than over land, while horizontal dispersion tended to be about the same over water as over land. Another tracer study has been conducted by MMS, Pacific OCS Region in the coastal area near Santa Maria (SRI International, 1983). Results of this study were not yet available.

9. Air Quality: Air quality in a particular area depends upon the prevailing weather conditions, local topography, and proximity of sources of air pollution. Routine air pollution monitoring efforts are primarily concentrated in large populated areas or in areas near major pollution sources. Relatively few air quality data exist in the general area of the proposed lease sale.

Onshore emission sources are regulated by the local air pollution control agencies, the California Air Resources Board (CARB), and the federal Environmental Protection Agency (EPA). Ambient air quality standards have been promulgated by the State and EPA which set maximum allowable air pollution concentrations to protect human health and welfare (Appendix G). The Clean Air Act, as amended in 1977, requires the State to prepare a State Implementation Plan (SIP) for those regions that do not meet the national ambient air quality standard for any pollutant regulated. The SIP outlines a strategy for attaining the air quality standards.

Air emissions on the OCS are regulated by the U.S. Department of the Interior (DOI). These regulations establish a review process for offshore emission sources designed to prevent significant adverse effects on onshore air quality (30 CFR 250.57). A brief overview of the regulations is given in Appendix H. A more detailed discussion is presented in 45 Federal Register 15128-46 (1980), 47 Federal Register 16349-59 (1982) and POCS Technical Paper No. 83-2 (FSI, 1983b).

Table III.A.9-1 summarizes current (1982) compliance status for the South Central Coast Air Basin. The discussion of air quality in the following paragraphs is based on air quality monitoring performed in 1981 (CARB, 1981).

Ozone is the most common air pollutant in many California coastal areas. Ozone results from a complex series of photochemical reactions involving nitrogen oxides, hydrocarbons and other pollutants in the atmosphere. The Federal ambient standard for O_3 is 12 parts per hundred million (pphm) for the maximum 1-hour average. The corresponding California ambient standard is 10 pphm.

The highest observed 1-hour O_3 level in San Luis Obispo County was 10 pphm at Morro Bay, Nipomo, and Paso Robles. These levels are below the Federal standards. However, the State standard was violated once at each of the above monitored sites. In Santa Barbara County, highest measured levels were 10 pphm at Santa Maria, 8 pphm at Lompoc, 11 pphm at Santa Ynez, 11 pphm at El Capitan Beach, 18 pphm at Goleta, and 24 pphm at Santa Barbara. In the coastal area adjacent to the Santa Barbara Channel, there is a definite increase in O_3 concentrations from west to east.

Measurements of TSP indicated violations of the 24-hour State standard at many locations. Many monitoring stations in Santa Barbara County recorded violations of the Federal standard. Highest concentrations were measured at Santa Maria, where a maximum 24 hour average of 518 ug/m^3 was recorded. The average geometric mean ranged from 48 to 58 ug/m^3 in San Luis Obispo County, and from 38 to 92 ug/m^3 in the western portion of Santa Barbara County.

Measurements of NO_2 did not show any violations of Federal or State ambient air quality standards. The California 1-hour average NO_2 standard is 470 ug/m^3. In San Luis Obispo County the maximum 1-hour average NO_2 concentration was 220 ug/m^3 observed at San Luis Obispo. In Santa Barbara County the maximum 1-hour average NO_2 concentration was 282 ug/m^3, observed at Santa Barbara. Maximum annual average NO_2 concentrations ranged from 9 to 30 ug/m^3 in San Luis Obispo County, and from 17 to 43 ug/m^3 in Santa Barbara County.

Concentrations of SO_2 were below Federal and State air quality standards. The highest observed 1-hour average concentration was 707 ug/m^3 at Nipomo in San Luis Obispo County. The California Ambient standard is 1310 ug/m^3.

The maximum 24-hour average SO_2 level at Nipomo was 99 ug/m^3. The Federal standard for 24-hour average SO_2 levels is 365 ug/m^3. Maximum annual average SO_2 levels ranged from 3 to 10 ug/m^3 in San Luis Obispo County, and from 1 to 5 ug/m^3 in Santa Barbara County.

Measurements of CO were below ambient air quality standards. The maximum 1-hour average CO concentration was 11,429 ug/m^3 at San Luis Obispo and 17,142 ug/m^3 at Santa Barbara.

<u>Noise</u>. Most of the shore region, experiences relatively low noise levels. At most locations the predominant sounds are associated with wind noise, ocean surf, boat and vehicular traffic. Depending upon wind and sea conditions, ambient noise levels at the shoreline typically range between 40 and 60 decibels (dBA*) and may approach 30 dBA during calm periods. Even though

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*dBA is defined at the A-weighted decibel level. It is a weighted average of sound levels across the range of frequencies sensed by the human ear.

these sound levels are nearly the same as those experienced in suburban areas, many persons find "natural sounds" more aesthetically pleasing than man-made sounds of the same level. Urban and industrial areas, by comparison, experience noise levels of 70 dBA.

B. Biological Environment

1. Intertidal Benthos: Intertidal habitats are of two principal types, rocky and sandy. Gradations, such as unstable boulders and human constructed bulkheads, wharfs, breakwaters, etc., occur but most of the coast can be classified as either sandy or rocky.

The rocky shore intertidal substrate forms a stable platform to which macroalgae and invertebrates attach and obtain a firm hold against the force of waves. Among the cover/protection given by the larger attached (sessile) plants and animals, live a myriad of usually smaller invertebrates. Some attach to the larger basal organisms while others move among the community grazing on vegetation. Some filter small planktonic particles from the water, while others are predators of other community members. During high tide, while the intertidal is covered with water, fish feed on the productive intertidal community.

Factors which influence the distribution, abundance, and species composition of rocky intertidal shores may be divided into two categories: 1) physical factors, and 2) biological factors. The more important physical factors include exposure and impact of waves, substrate composition, texture and slope of the substrate, desiccation, water temperature, and light. The more important biological factors are competition and predation. Generally, the upper intertidal area contains some species which appear to be transitional between land and sea forms. These organisms can survive neither completely on land nor completely in the sea. The upper intertidal grades into the lower intertidal which has more and more species occupying more and more of the available space, until, somewhere around midlevel and below, every conceivable space is inhabited by algae or invertebrates. In general, the upper vertical limits of rocky shores are determined by physical conditions, while the lower vertical limits are controlled by the biological factors (Carefoot, 1977).

The environment of the sandy intertidal is considerably less stable than that of the rocky intertidal. Every wave on a sandy intertidal beach moves large amounts of sand. Animals living on surf-swept rocky intertidal areas have solved the problem of wave shock by evolving powerful attachment devices or by living in cryptic habits. Organisms on surf-swept sandy beaches achieve the same solution by burrowing (burying) themselves in the sand. Nevertheless, sandy beaches have comparatively fewer organisms and species, and population level fluctuations are far greater.

The extent of rocky shores and sandy beaches is approximately equal (53% rocky and 47% sandy) in central-northern California. See BLM (1980) Visual #5 for distribution of rocky and sandy beaches.

Rocky Intertidal. Scientific literature on the rocky intertidal in central-northern California is spotty. A few areas, particularly the Pacific Grove area near Monterey, are very well studied and the rest of the coast hardly studied at all. The Pacific Outer Continental Shelf Office of MMS has contracted Woodward and Clyde (1982) to conduct a helicopter general survey of the principal intertidal species to complement similar studies in Southern California by Littler (1979) and Littler and Littler, (1980).

Odemar, et al., (1968) described the coast from a geological perspective between Fort Ross and Point Lobos, and included a generalized description of the rocky intertidal communities typical of a Central California area. An overview of the central-northern California coast is in the Summary of Knowledge papers written for BLM by Hancock (1977) and Hardy (1977). These list nearly all pertinent studies in the form of a partially annotated bibliography and can be supplemented by similar papers written for Southern California by Murray (1974), Bright (1974), BLM (1975) (1979). Papers depicting certain areas of the coast are also summarized in the EIS for Sale No. 53 (BLM, 1980) together with an overview of the intertidal communities of the Central and Northern California Coast.

The study area is within the Oregonian biogeographical province which begins at Point Conception and extends to Puget Sound, Washington or Prince William Sound, Canada depending on the author (Valentine, 1966 and Newman, 1979). Literature on rocky intertidal species distributions indicates that the change in species composition in central-northern California is not major (Stephenson and Stephenson, 1972), (Woodward and Clyde, 1982).

Extensive intertidal sampling has been conducted at Government Pt., part of the Pt. Conception complex (Littler, 1979, 1980; Martz and Littler, 1979) and at Pt. Arguello (Chambers Consultants and Planners, 1980; Rodrique, et al., 1976 and Newswanger, in Chambers Consultants and Planners, 1980).

Around Pt. Conception, there are a number of species with a limited geographical range. Littler and Littler (1980) reported the most pronounced break between warm and cold water algae occurred at Government Point. The species diversity at Government Point was the highest of all intensely studied mainland sites in Southern California (Littler, 1980). At Point Arguello, approximately 19 km (12 mi.) north of Point Conception, Littler and Littler (1980) reported a unique dense population of intertidal black abalone which may serve as brood stock for much of the mainland coast of Southern California. Newswanger (1980) reported from preliminary analyses that the geographic range of 17 species of littoral molluscs ended at the Point Conception boathouse.

The Santa Barbara Channel in Southern California is known as an area containing many endemic species (BLM, 1979). Little has been written about endemic species north of Pt. Conception, largely because few investigations have been conducted in the area. However, it is assumed intertidal and shallow subtidal areas just north of Pt. Conception have endemic species by virtue of their proximity to the division between major biogeographic provinces.

Despite the general similarity of most dominant species, some populations reach high densities at certain areas, while being in low numbers at other areas. According to Littler and Chan (personal communication), certain areas

TABLE III.B.1-1

SENSITIVE ROCKY INTERTIDAL AREAS OF CENTRAL CALIFORNIA BASED ON ISOLATION, FLAT PLATFORMS AND DISTANCE OF CONTINUOUS HABITAT WITHOUT SIGNIFICANT INTERRUPTION

Central California North of Proposed Sale Area

(1) Point Reyes Headlands -
Very abundant flora and fauna, particularly dense mollusk populations.

(2) Agate Beach and Duxbury Reef -
Largest flat intertidal reef in California with some isolation north and south from other rocky intertidal areas. Giant mussel populations. Rare Mesoglossus sp. hemichordate worm.

(3) Farallon Islands -
Rocky area isolated from other rocky intertidal areas by approximately 15 miles.

(4) James Fitzgerald Marine Reserve through Piller Point -
Broad flat rocky platforms. Highly productive intertidal stretch of coast extending for 5 miles. Similar assemblages to Duxbury Reef.

(5) Ano Nuevo Island -
Extensive flat intertidal platforms.

(6) Monterey Peninsula -
Has 80% of known flora of the western coast of North America. Is a major biogeographic transition zone. High density of invertebrates, including mollusks. Summer fog prevents dessication to organisms at low tide. Historic scientific area. Includes areas semi-protected from large Pacific Waves (Pebble Beach). Flat intertidal platforms include:

a. Table Rock Area -
and

b. Needle Rock Point -

c. Pacific Grove Marine Gardens ASBS -
Important intertidal area; one of the best studied in the country, partly because of its great diversity of species and richness.

d. Cypris Point -
and

e. Point Pinos -
Along 17 Mile Drive, Monterey Peninsula, the two areas which stand out, having the broadest flat rocky platforms along a stretch of coast, and having a relatively continuous rocky intertidal with scattered flat platforms.

(7) Carmel River State Beach to Soberanes Point (including Point Lobos Reserve) -

Many deep coves giving a lot of surface area to intertidal habitats. Several semi-protected areas including Whaler's cove. Only rich population of intertidal macroalgea Eisenia in central-northern California (Point Lobos Reserve). Flatworm Polychoreus carmelensis endemic (Carmel Point).

(8) Piedras Blancas Point Area -
Flat intertidal platforms.

(9) Cayucos to San Simeon Beach -
Very rich intertidal communities and diverse habitats, including intertidal pools, sea stacks, boulder beaches. Includes broad flat intertidal area at San Simeon Point which is somewhat isolated to the north and south by sand beaches and is very diverse in chitons and barnacles.

Proposed Sale Area

(10) North of Spooner Cove to Point San Luis -
Numerous intertidal black abalone, limpets, chitons and mudbanks. Flat intertidal platforms, including a very extensive one just north of Spooner Cove which is isolated from other rocky intertidal areas to the north by large sandy beach (Morro Bay spit).

(11) Pirate's Cove Area - Fossil Point to Mallough Landing (Avila) -
Numerous flat intertidal platforms. Numerous intertidal black abalone, chitons and mudbanks.

(12) Mussel Point to Point Sal -
Low flat intertidal platforms. Isolated north and south from other rocky intertidal areas by sandy beaches. Numerous intertidal black abalone, limpets, chitons and mudbanks.

(13) Packard Point to Purisimo Point off Vandenberg Air Force Base -
Numerous flat platforms. Isolated north adn south from other rocky intertidal areas by sandy beaches.

(14) Point Arguello to Cojo Point in Southern California, including Point Conception -
Dividing line between major biological provinces and consisting of both northern (Oregonian) and southern (California) species.

have unusual species, populations, or rare species, see Table III.B.1-1. Rocky intertidal areas more sensitive than the norm to oil spills were identified from topographic and biological features. One assumption is that not all areas of the coast are equally sensitive to oil spills, with different abilities to recover from spills.

Other assumptions for identifying sensitive areas are as follows:

(1) The occurrence of flat rocky intertidal platforms. Spilled oil has a greater potential of becoming stranded on flat areas than sloped areas or sheer straight cliffs (Bundlach and Hayes, 1978).

(2) Isolation from other rocky intertidal areas. Should a spill significantly decrease or obliterate an intertidal population or community, recovery which typically comes from drifting larvea or spores, will be retarded for those species. The distance between the harmed area and brood stock would be too far for extensive immediate settling.

(3) Extensive intertidal areas along the shore without significant interruptions by sandy beaches, etc. A rocky intertidal area extending essentially uninterrupted for many miles was of less concern than a small area even if they both had broad flat intertidal platforms.

(4) Concern for areas by sources outside this office; such as Areas of Special Biological Significance.

Intertidal biologists who have examined areas of the coast were consulted for areas of unusual productivity, assemblages or species.

Those consulted include:

Dr. Gordon L. Chan - College of Marin
Dr. Mark M. Littler - Smithsonian Institute
Dr. Stephen N. Murray - Cal State Irvine

Also consulted for areas north of Pt. Reyes were Dr. D. DeMartini and Dr. Milton J. Boyd of Humboldt University.

The areas judged sensitive were in part selected based upon topographic features from 1) Woodward-Clyde videotape taken from a fixed-wing aircraft, 2) Woodward-Clyde videotape taken from a slower low-flying helicopter, and 3) conformation of sensitive areas from a fixed-wing overflight.

The possibly sensitive intertidal areas are shown in Table III.B.1-1.

<u>Sandy Beaches</u>. Because of the continued restructuring of sandy beaches, the number of individuals per species varies greatly from year to year. There is, however, a characteristic group of animals which live just below the low tide line or within the sand between the tide lines. A few organisms live higher upon the beach in burrows or beneath organic debris. Additional general comments on sandy beach ecology are presented by Cubit (1969), MacGinitie and MacGinite (1949), Ricketts et al., (1968), and Trask (1970).

Accounts dealing with sandy areas in central-northern California are few. Although Allen (1964) collected 20 species in Northern California, only the mole crab was collected every year (1958 to 1961); the other species were absent or in low abundance at least one of the years studied. As few as 3 species were collected at a site, while the maximum collected per site was 18, far fewer than rocky intertidal areas.

Two species of recreational and economic importance, the razor clam *Siliqua patula*, typical of the northern regions, and the pismo clam *Tivela stultorum*, more common in Central California, should be mentioned as important members of this habitat.

Important sandy beach or clam areas reported by Woodward and Clyde (1982) and Gordon Chan and Stephen Murray (Personal Communications, 1982) include:

Central California North of Proposed Sale Area

(1) Duxbury Reef Sand Flats
(2) Halfmoom Bay Harbor
(3) Monterey Bay beaches
(4) Atascadero State Beach

Proposed Sale Area

(5) Pismo Beach
(6) Pismo-Oceano Beach

2. Subtidal Benthos: The continental shelf of central-northern California gradually slopes to the continental slope. Although it is periodically cut by canyons or interrupted by biologically important shallow banks or sea mounts, the shelf along central-northern California is a typical continental shelf in contrast to the atypical Southern California continental shelf. The sediment of the central-northern California shelf generally grades from coarser sandy sediment in shallow water near shore to finer silt and clay substrates in the deeper waters near the outer margin. The benthic invertebrates similarly grade from filter or suspension feeders on sandy substrates to deposit feeders in finer sediments. Although little information is available on the bottom communities of the region, it is reasonable to assume that they are productive and diverse owing to the indirect evidence of abundant upwelling and high fisheries landings. The presence of endemic species is not well known, but it is assumed to be less than in Southern California. Central California has important kelp forests which gradually decrease in Northern California.

The subtidal benthic communities and assemblages of Central California are not well known, although the Monterey Bay region may represent an exception to this rule. A comprehensive literature survey by Winzler and Kelly Consulting Engineers (1977) summarized previous benthic studies in the central-northern California region. Other studies of central-northern California subtidal benthic communities have been conducted and include Allen (1964), Hardy (1972, 1973), Johnson (1971) and Odemar, et al., (1968); however, most of these are relatively localized in scope and tend to focus on areas close to shore.

The greatest concern for the effects of offshore oil development on the subtidal benthos are in the areas of hard bottoms and topographic highs, such as sea mounts, reefs, etc. Although largely unexplored, most of these topographic highs may have rocky outcrops and may be areas of heavy fish concentration.

The topographic highs, reefs and known rocky outcrops (Graphic No. 2) of concern in the Proposed Sale Area are: the large Santa Lucia Bank, two already leased banks off Santa Maria, and scattered rock outcrops off Point Arguello. The tract numbers of the known rocky outcrops in Graphic No. 2 are shown in Table III.B.2-1. Several of the areas have been surveyed to varying degrees (Hooks, McCloskey and Associates, 1982; Nekton, 1982; and Dames and Moore, 1982).

Over 15 apparently new species have been found in these studies, but no species thought to be sensitive or rare were reported. However, more research is needed to determine if some of these species may be rare, endemic or sensitive to oil development. Interrelationships within the community are not well known, in any case.

Table III.B.2-2 shows a list of possible new species collected during the Dames & Moore (1982) study and compiled by Eric Hochberg of the Santa Barbara Museum of Natural History. Table III.B.2-3 shows a species of Cnidara (Coelenterates, sea anemones, corals, jellyfish) identified during the Nekton (1982) study, worked up by John Ljubenkov of La Mer Taxonomic Consultants (personal communication).

It is important to point out that the possible new species on these tables are tenuous. The lists and the species on them have not been published in the manner whih constitutes a valid scientific (taxonomic) publication and therefore the information is included as an indication of the potential which the proposed area holds for scientific discovery.

The tenuous nature of these species lists is perhaps best described by Hochberg in a November, 1982 letter to Dames & Moore.

> I want to strongly caution reference to "newly discovered taxa". Use of this designation is very misleading since it has the inherent bias of being an unsubstantiated interpretation and hence really meaningless. We have not canvassed the systematic community in California or in the United States as a whole to indeed determine if this is actually true for each taxa indicated as "newly discovered".

Of the 23 species shown in Table III.B.2-2, the 9 marked with a dot are not new. In addition to the 14 possible new species shown in the list, Dames & Moore may have collected a new Nemerteum worm, Sipunculan worm, sponge, Ascidian, and Platyhelminthes flatworm.

On Table III.B.2-3, Ljubenkov indicates that Corymorpha sp. A, Clavufaria N. sp., and Palythoa sp. A were probably counted as new from the Santa Maria area, but they are fairly common in Southern California. In another study conducted near Point Conception, Ljubenkov indicated that, within the phylum Cnidaria (Coelenterata) 9 species could be only identified to genus, three closely resembled described species but could not be confirmed, and two were

TABLE III.B.2-1.

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THAT HAVE SUBTIDAL ROCKY BOTTOMS

3, 4, 5, 14, 15, 16, 19, 20, 21, 22, 34, 35, 36, 37, 49, 50, 51, 52, 53, 64, 65, 66, 67, 68, 81, 82, 83, 84, 94, 98, 99, 100, 101, 102, 112, 113, 114, 118, 119, 120, 121, 122, 139, 140, 141, 142, 143, 159, 160, 161, 162, 163, 166, 167, 179, 180, 181, 182, 183, 199, 200, 201, 202, 203, 204, 218, 219, 220, 221, 222, 223, 227, 239, 240, 241, 242, 243, 244, 260, 261, 262, 263, 274, 281, 282, 283, 284, 285, 286, 287, 305, 306, 307, 308, 309, 328, 329, 336, 341,

TABLE III.B.2-2

POSSIBLE NEW TAXA COLLECTED FROM
SOFT AND HARD BOTTOMS IN SANTA MARIA BASIN
FROM DAMES AND MOORE (1982)

Infaunal Samples

Mollusca

°Mactra sp. A: possible undescribed; known previously from southern California

Montacuta sp. : probably undescribed species; more specimens required for confirmation

cf. Paramya sp. A: species of an undescribed genus often confused with Saxicavella pacifica

Platomysia sp. A: may be different form P. meroeum; taxonomy of family in disorder

Polychaeta

°Aricidea sp. B: apparently not described buy known form southern California

Euchone sp. A: possible new species

°Lumbrineris sp. D: known for years but undescribed

°Myriochele sp. D: known but not described

°Pista sp. B: known but not described

°Poecilochaetus sp. A: known but not described

Crustacea, Amphipoda

Accedomoera sp.: possible new species

Caprellidae: genus not certain; possible new species

Deutella sp.: possible new species

Crustacea, Cumacea

°Diastylis sp. A: known but not described

Crustacea, Isopoda

Pleurogonium cf. rubricundum: this species known from Puget Sound; possibly new species

Echinodermata, Holothuroidea

°Cucumaria sp. C: known and common but undescribed

°Leptosynapta sp. A: known and common but undescribed

Trawl and Diver Samples

Porifera

Demospongiae sp. a: probably new species; genus not certain

Cnidara, Anthozoa

Anthozoan sp. 1: specimen not sufficient for certain identification; possibly new species

Octocorallia: probably new species; genus not certain

TABLE III.B.2-2 (cont.)

Crustacea, Amphipoda
cf. Djerboa sp.: genus not known from Pacific Coast; probably new species

Crustacea, Isopoda
Discerceis sp.: probably new species
Rocinella sp.: probably new species

°known species but undescribed

TABLE III.B.2-3

SPECIES LIST OF CNIDARIA COLLECTED
IN SANTA MARIA ON SOFT AND ROCKY BOTTOMS
DURING NEKTON SURVEY (1982)

HYDROZOA
Fam. Plumulariidae
  Cladocarpus vancouverensis - outer shelf, mainland & insular
  Plumularia spp.
Fam. Haleciidae
  Halecium sp
Fam. Sertulariidae
  Sertularella sp
Vidae
  Tubiclava cornucopiae - polyp stage of a jellyfish
Fam. Corymorphidae
  °Corymorpha sp. A

ANTHOZOA
  Octocorallia
Fam. Clavulariidae
  °Clavularia n. sp.
Fam. Gorgoniidae
  Eugorgia sp
Fam. Telestidae
  nr. Sarcodictyon sp. - group needs work, but probably new species
  Zoanthidea
Fam. Zoanthidae
  °Palythoa sp. A
  Actiniaria
Fam. Edwardsiidae
  Edwardsia sp
Unidentifiable anemones
  Corals
Fam. Caryophylliidae
  Caryophyllia arnoldi
Fam. Astrangidae
  Astrangia sp. - very small specimens

°new species to Santa Maria area, but has also been collected in Southern California identified to order level. In addition, 10 possibly new species of sea anemones may have been examined. The most significant find may be a new solitary coral species.

Chambers Consultants and Planners, 1980, conducted a nearshore survey for State Tidelands leasing in the Point Arguello to Point Conception area on both rocky and soft bottoms. They found 15 new species and approximately 49 rare species (also see Section III.B.1). The distribution of some of these species could extend further offshore into areas of the proposed lease sale.

In shallow water off the area from Spooner Cove to Point St. San Luis is a purple coral, Allopora californica, population (State of California comments to Lease Sale 73 DEIS).

Kelp. Kelp forests serve as habitats for other algae and a myriad of invertebrates that attach to the kelp, feed on the kelp, live in the protection of the holdfasts of the kelp, or are otherwise attracted to the forests. Fish are attracted to kelp forests primarily for protection and food. Two seaweeds, Macrocystis and Nereocystis, form kelp forests in California and have overlapping ranges in Central California.

The giant kelp or Macrocystis, identified by having many floats (pneumatocysts), is distributed from Sitka, Alaska to Pt. Abrevjas, Baja California, but does not form extensive forests north of Pt. Ano Nuevo. However, DeMartini (personal communication) reports small patches of Macrocystis as far north as Mendocino County. The bull kelp or Nereocystis, having a single float from which originate numerous lamina or blades, is distributed from Alaska to Santa Barbara, but forms forests only north of Point Conception (Smith 1969; Bell and Ally, 1972).

Two significant life history differences exist between the two kelp species. Nereocystis is generally an annual, and the forest formed by this species is almost completely replaced every year. In Central California, at least at Diablo Cove, Nereocystis essentially lives for 2 years (Burge and Schultz, 1973). Macrocystis is a perennial and the individual plants of the forests tend to remain for periods of over a year, up to 6 years (North, 1971).

Anderson and North (1966) have found that, despite an extremely high rate of sporulation, the sucessful recruitment of Macrocystis sporophytes decreases exponentially with distance from the parent plant and is essentially limited to an area within 5 m of the parent. That is, young plants are only found very close to the parent plant. This contrasts with the dispersibility of other benthic organisms which have spores or larvae that drift for miles before settling. This has resulted in speculation that drifting plants, rather than spores, may serve as an important means of propagating the species.

Since Nereocystis as well as many other brown algae have similar life histories and dispersal mechanisms, a mass mortality of kelp or other brown algae species in a defined area may result in very slow recovery because of the limited dispersal mechanism resources.

3. Fish Resources: The marine environment offshore California is rich in fish life. Of the 562 species of coastal marine fishes known to occur offshore California, about 500 are found in central-northern California waters (Miller and Lea, 1972, 1976; Winzler and Kelly, 1977). These counts do not include all of the deep-sea fishes, so the total number of fish species offshore central-northern California probably exceeds 500. Most of these species occur in the proposed sale area. One reason the proposed sale area is rich in fish life is this area constitutes a transition zone between southern warm-temperate, sub-tropical waters and northern cold-temperate waters. Thus, both warm-water and cold-water fishes are found either seasonally or year-round off the proposed sale area. Another reason this area is rich in fish life is it is an area of significant upwelling. Nutrients from upwelling contribute to the food base and therefore productivity of an area.

The fish offshore California occur in three main regions: 1) epipelagic, 2) deep-sea, and 3) benthic. The epipelagic zone consists of roughly the upper 150-200 meters (492-656 feet) of the ocean. Some of the smallest (e.g., anchovies) and largest (e.g., tunas) fishes occur in this zone. The deepsea zone consists of roughly the region from 200 meters (656 feet) to 4,000 meters (13,123 feet). A very large number of small (less than 0.3 meters long), black or dark fish with silvery reflective sides and frequently with luminescent organs live in this region. The benthic region includes the bottom of the ocean at all depths. Many commercially and recreationally important species reside in this region.

Although these designations are useful, the regions overlap. For example, at least part of the lives of deep-sea fishes are spent in waters several hundred to thousands of meters deep. However, many deep-sea fishes undergo periodic vertical migrations and, therefore, may be found in the upper 100-500 meter layer of the ocean (epipelagic zone) during part of their lives.

The fish species most vulnerable to impacts from offshore oil and gas activities occur in the epipelagic and benthic zones and are discussed below. Estuaries (see Section III.B.7) and kelp beds (see Section III.B.2) are also important fish habitats.

PROPOSED SALE AREA

Epipelagic species which seasonally or regularly occur in the proposed sale area include (California Department of Fish and Game, 1980):

- Albacore
- Blue Shark
- Bonito Shark
- California Barracuda
- Jack Mackerel
- King (Chinook) Salmon
- Northern Anchovy
- Pacific Bonito
- Pacific Herring
- Pacific Mackerel
- Pacific Saury
- Pacific Whiting
- Silver (Coho) Salmon
- Steelhead
- Swordfish
- Thresher Shark
- White Shark
- Yellowtail

Most of these species are widely distributed in the proposed sale area, and it is unlikely that oil and gas operations will harm enough individuals of any one species to significantly decrease its population size. However, northern anchovies and Pacific herring are of concern since their restricted distributions during a significant part of their life cycles make them vulnerable to significant impacts from oil and gas activities.

The northern anchovy (Engraulis mordax), a pelagic schooling fish, is one of the most abundant species in the region. Their extremely large numbers make them important consumers of smaller marine organisms as well as food for larger fishes.

The range of the anchovy is from Baja California to British Columbia, but it is most abundant south of San Francisco particularly in Southern California and Monterey Bay. Anchovies are found mostly within 100 miles of the coast. South of San Francisco, spawning occurs primarily in winter and spring near shore. In summer and fall months, large compact schools are found during daylight hours along submarine escarpments and canyons at depths of 110-183 meters (360-600 feet). The schools rise to the surface at night and disperse. As the night passes, they tend to school more tightly until dawn, when they return to the deeper waters. These behavior patterns are similar to some extent throughout the year and may be influenced by water temperature, availability of food, spawning condition, and amount of ambient light at night. In spring, many small schools are found at the surface during the day while the fish tend to scatter over a wide area at night. From April to June, extremely large dense surface schools, containing up to several hundred tons, form during daylight hours and disperse or move into deeper water at night. These schools are usually found within 37 km (20 nautical miles) of the coast (Frey, 1971). Anchovies reach reproductive maturity in 1-2 years and generally live 3-4 years unless captured. Anchovies are filter feeders and they feed on all kinds of plankton.

The Pacific herring (Clupea harengus) is a pelagic schooling fish that ranges from San Diego to the Bering Sea and occurs offshore Japan. These fishes may be found from tidewater, where they spawn, to at least 120 miles at sea. The major herring populations in California waters are from stocks that spawn in San Francisco Bay and Tomales Bay. However, small runs occur in the proposed sale area at Morro Bay and San Luis Obispo Creek (Spratt, 1981). Spawning occurs during fall, winter, and spring. Eggs are deposited on seaweed, pilings, and anything projecting above the bottom. Adults return to the ocean immediately after spawning. Most larvae move out of the estuary soon after hatching. Herring reach sexual maturity in 3-5 years and generally live to 9 years in California waters.

Benthic species which occur in the proposed sale area include (California Dept. of Fish and Game, 1980):

Offshore Bottom Fish

Flatfish (several species)	Rockfish (several species)
Lingcod	Sablefish
Pacific Whiting	Spiny Dogfish
Ratfish	Surfperch (2 species)

Shallow Rocky Bottom Fish

Cabezon	Kelp Greenling
California Sheephead	Lingcod
Giant Kelp fish	Monkeyface-eel
Green Sturgeon (some years)	Opaleye
Jacksmelt	Painted Greenling
Kelp Bass	Rockfish (several species)

Shallow Sand Bottom Fish

California Barracuda	Queenfish
California Grunion	Round Stingray
Flatfish (several species)	Shovelnose Guitarfish
Jacksmelt	Surfperch (several species)
Northern Anchovy	Topsmelt
Pacific Butterfish	White Croaker
Pacific Herring	White Seabass

Morro Bay also is an important fish habitat. Common fish in the Bay include (California Dept. of Fish and Game, 1980):

- Bat Ray
- Bocaccio (nursery)
- Flatfish (several species)
- Grey Smoothhound
- Horn Shark
- Jacksmelt
- Leopard Shark
- Northern Anchovy
- Pacific Staghorn Sculpin
- Round Stingray
- Surfperch (several species)
- Topsmelt

Additional information on Morro Bay is provided in Section III.B.7.

As with epipelagic species, the benthic species of concern are those with restricted distributions during a significant part of their life cycles, particularly if they are stressed from other pressures such as fishing. In the proposed sale area, the principal benthic species of concern is petrale sole. This species ranges from Alaska to Baja California. Life history information on this species and other commercially important species is presented in Table III.B.3-1.

TABLE III.B.3-1

FLATFISH LIFE HISTORY CHARACTERISTICS

Species	Depth Range (meters)	Known Spawning Areas (meters)	Spawning Period	Age at Sexual Maturity (years)	Maximum Age (years)
Dover Sole	37-1463 (120-4800 ft)	>549 (>1800 ft) Offshore Bodega Head and Pigeon Pt.	Nov-Mar	8-9	25
English Sole	18-274 (60-900 ft)	9-165 (30-540 ft) Offshore San Francisco, Monterey Bay, and Santa Barbara Channel	Nov-Mar	5	18
Petrale Sole	37-457 (120-1500 ft)	274-411 (900-1350 ft) Offshore Pigeon Pt., Pt. Sal	Nov-Mar	4-5	25
Rex Sole	37-457 (120-1500 ft)	55-91 (180-300 ft)	Jan-June	3	24
Starry Flounder	0-165 (0-540 ft)	Uncertain	Nov-Feb	2-3	10
Pacific Sanddab	18-110 (60-360 ft)	Unavailable	July-Sept	6-8	13
California Halibut	0-73 (0-240 ft)	5-18 (18-60 ft)	Feb-July	2-6	Unavailable

Sources: Pacific Fishery Management Council (1982), Winzler and Kelly (1977), Frey (1971), and Tom Jow, California Dept. of Fish and Game (pers. comm.).

AREAS OUTSIDE THE PROPOSED SALE AREA

Fish resources outside the proposed sale area may be vulnerable to impacts from oil spills. Species of concern north of the proposed sale area to Pt. Reyes include northern anchovies, Pacific herring, king salmon, and silver salmon. Northern anchovies are found mostly within 100 miles of the coast. Pacific herring are found from tidewater to at least 120 miles at sea. As discussed above, San Francisco Bay is a major spawning area for Pacific herring. Small spawning runs also occur at Elkhorn Slough and the southern part of Monterey Bay (Spratt, 1981). See discussion above for additional information on northern anchovies and Pacific herring. One of the most important recreational and commercial species of fish using the overlying waters of the continential shelf off the coast of California is salmon. Salmon begin their life in freshwater, use the estuarine environments as juveniles, either to feed or merely as a passage to the open ocean, and then feed as immature adult fish in either estuaries or in the open ocean until sexual maturity. On attaining sexual maturity, they return to freshwater or to the highly dilute upper areas of estuaries to spawn. Since salmon die after spawning, successful spawning is very important to survival of these populations. These fish often return to their river of origin to spawn. King salmon (Oncorhynchus tshawytscha) generally spawn in larger river systems north of San Francisco and the Sacramento River. Silver salmon (O. Kisutch) spawn in many small streams and rivers north of Monterey, including the San Lorenzo River, but the most important California streams are north of San Francisco. Most king salmon enter spawning streams in the "fall" (late summer to early fall) or in the "spring" (spring to early summer). Most silver salmon enter spawning streams in fall and early winter. Downstream migration of king salmon usually occurs during the first few months of life, whereas downstream migration of silver salmon usually doesn't occur until salmon are more than a year old. King salmon reach sexual maturity in 3-4 years and silver salmon reach maturity in 2-3 years.

Another species that is abundant in this region is the opalescent or market squid (Loligo opalescens). Squid are not fish but they are included in this section since they are active swimmers. The opalescent squid ranges from British Columbia to central Baja California and may occur in the Gulf of California. Although during most of their life squid are widely distributed offshore, squid congregate inshore in very large numbers during spawning. Spawning occurs in about January or February in Southern California and about April in the Monterey Bay area. Monterey Bay and the Santa Barbara Channel Islands are the most important spawning areas but large spawning aggregations are also known to occur along the coast from Monterey to San Diego. Squid live 1-2 years and die after one spawning season.

South of the proposed sale area, in the Santa Barbara Channel, the species of concern are northern anchovies and squid. These species are discussed above.

Further information on fish resources discussed above and information on other fish resources are presented in Winzler and Kelly (1977).

4. Marine Mammals: The information on marine mammal distribution and abundance in central-northern California is excerpted from the second year report on the study being performed for MMS by the Center for Coastal Marine Studies, University of Santa Cruz, hereafter designated the CCMS (1982). Data were obtained primarily from aerial surveys. Details of the methods are found in the report.

Cetaceans. More than 22 species of cetaceans (whales, porpoises and dolphins) are known to occur in central-northern California waters. See Table III.B.4-1 for a list of species.

The following information is excerpted from the chapter on cetaceans (Dohl, et al., in CCMS, (1982)).

Cetaceans were found in all months and in all parts of the study area. Use varies along some portions of the coastline.

The major segregation is by way of water depth, with 70 percent of the animals seen over the continental slope. A stratification of the study area from the shoreline seaward into three realms (0-99 fm, 100-999 fm, and 1,000 fm and greater) produces some significant distributional information.

	0-99 fm	100-999 fm	1,000 fm+
Percentage of sightings:	47.2	36.5	16.3
Percentage of animals:	6.1	69.5	24.4
Percent of study effort:	18.2	32.6	49.2

The high sighting percentage, coupled with the extremely modest percentage of animals found in the nearshore realm of 0-99 fm, reflects the pod composition of the animals found. Solitary gray whales and numerous small groups of harbor porpoises constitute the majority of nearshore sightings. In contrast, the mid-water realm of 100-999 fm (covering the continental slope) is favored by the majority of species that aggregate into large schools. The Pacific white-sided dolphin, grampus, and northern right whale dolphin are examples of this type of cetacean. School size in the nearshore waters averaged approximately 3 animals, while over the slope the groupings exceed 69 animals each.

Seasonal and geographical distributions can be roughly summarized as follows:

(1) Winter finds the highest densities and greatest use statewide.

(2) Summer has the lowest densities and sparsest use statewide.

(3) Autumn is the season when cetacean schools coalesce into larger aggregations.

(4) In all seasons the southern one-third of the study area central-northern California carries more animals, more individual schools and larger schools than the remainder of the study area.

TABLE III.B.4-1

CETACEANS KNOWN TO OCCUR IN CENTRAL AND NORTHERN CALIFORNIA WATERS IN ORDER OF OBSERVED FREQUENCY WITHIN THE BALEEN AND TOOTHED WHALE GROUPS

Common Name	Scientific Name
BALEEN WHALES	
***California gray whale	Eschrichtius robustus
***humpback whale	Megaptera novaeangliae
***blue whale	Balaenoptera musculus
***fin whale	Balaenoptera physalus
minke whale	Balaenoptera acutorostrata
*sei whale	Balaenoptera borealis
***right whale	Eubalaena glacialis
TOOTHED WHALES	
Pacific white-sided dolphin, lag	Lagenorhynchus obliquidens
northern right whale dolphin, lisso	Lissodelphis borealis
Risso's dolphin, grampus	Grampus griseus
Dall's porpoise	Phocoenoides dalli
harbor porpoise	Phocoena phocoena
killer whale	Orcinus orca
***sperm whale	Physeter catodon
pilot whale	Globicephala scammoni
Cuvier's beaked whale	Ziphius cavirostris
**pygmy sperm whale	Kogia breviceps
**dwarf sperm whale	Kogia simus
Stejneger's beaked whale	Mesoplodon stejnegeri
Hubb's beaked whale	Mesoplodon carlhubbsi
ginko-toothed whale	Mesoplodon ginkgodens
dense-beaked whale	Mesoplodon densirostris
Baird's beaked whale	Berardius bairdi
**false killer whale	Pseudorca crassidens
*common dolphin	Delphinus delphis
**Pacific bottlenose dolphin	Tursiops gilli
spotted dolphin (porpoise)	Stenella attenuata
spinner porpoise	Stenella longirostris
**streaker porpoise, striped dolphin	Stenella coeruleoalba

*Observed only once in two years
**Not observed during the first two years of the Santa Cruz Study
***Animal is on the Federal list of endangered species

School sizes reported by CCMS (1982) for the three most common small cetaceans in northern and central California were 1) Pacific white-sided dolphin-mean school size-137, maximum school size-2000, 2) northern right whale dolphin-mean, 147; maximum, 3000 but most less than 100, 3) Risso's dolphin-5-50 regularly, maximum 4000.

An indication of the densities of the larger whales comes from CCMS observations. In a year of flying semi-monthly surveys comprised of transects from the coast at every 5 of latitude (average distance per survey in excess of 2000 nm) CCMS observed the following numbers of whales: 87 sperm whales, 940 gray, 208 humpback, 12 blue, 10 fin and 3 other Balaenoptera (CCMS, 1982, p. 79). With the exception of sperm whales and humpbacks, the endangered whales within the area of concern were generally sighted in groups of 1 or 2 animals. The majority of the humpback whales were sighted between Bodega Head and Point Montara. A large number of animals were observed in waters adjacent to Point Reyes (CCMS, 1982, p. 129).

Gray whale migration routes are shown in Figure III.B.4-1. Distribution and abundance of gray whales along the central-northern California coast were described in CCMS (1982) as follows:

> The earliest sightings of the southern migration occurred on 6 November with only a few animals; the main body arrived off the central California coast in late December. The majority of the southbound animals were observed within 2 nm of shore, with 6% of the sightings located 5 nm or more offshore. The greatest distance southern-migrating gray whales were seen offshore was 46 nm, due west of the town of Mendocino.
>
> Once again the northern migration was observed in two pulses or fronts. The initial movement comprised the bulk of the returning population, with the second and smaller pulse being fundamentally mother/young pairs. As in the past, the northern migration occurred closer to the shoreline than the southern. The mother/young sightings occurred extremely close inshore, frequently within the kelp beds or directly seaward of the breaker line. Less than 2% of the northbound whales were sighted greater than 5 nm offshore, with the maximum distance being one sighting of 11 animals 43 nm west of the Big Sur coastline.
>
> Excluded from the offshore computations are those sightings from Bodega Head, Gulf of the Farallones, Monterey Bay, and San Luis Obispo Bay. Animals in these areas are frequently found several miles from the coastline due to headland-to-headland traverses.

These observations are thought to reasonably represent the present migratory routes.

Pinnipeds. The following is excerpted from the pinniped section of the Center for Coastal Marine Studies Report (Pierson, et al., in CCMS, (1982)).

Five species of seals and sea lions use the resources of the central-northern California coast. Each has its season of peak abundance in the area and its characteristic annual cycle. The two most abundant species, the northern fur seal (Callorhinus ursinus) and California sea lion (Zalophus californianus), reach peak numbers during their migrations. In contrast, harbor seals (Phoca

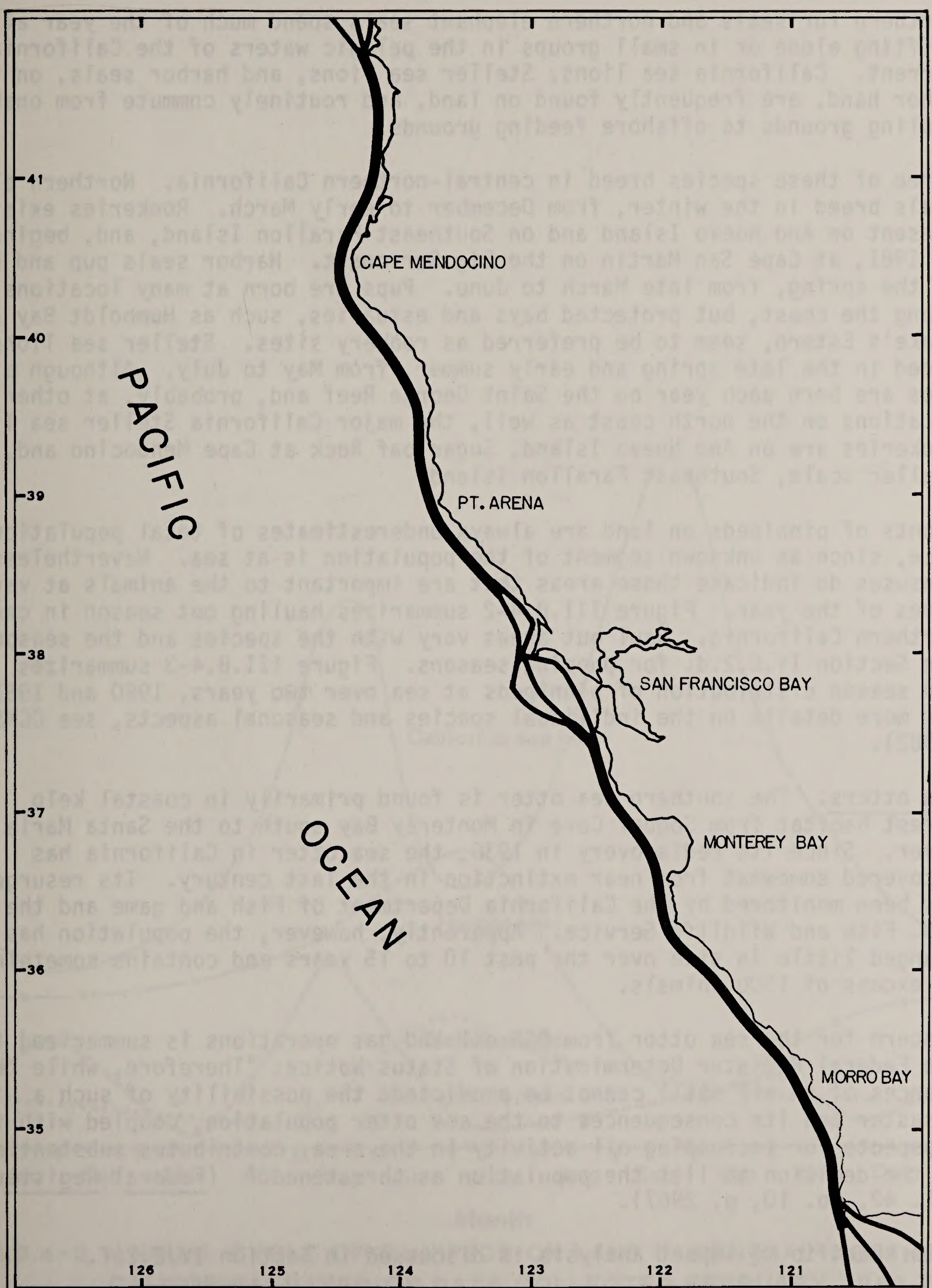

FIGURE III.B.4-1. GRAY WHALE MIGRATORY ROUTE PATHWAYS. FIGURE FROM CENTER FOR COASTAL MARINE STUDIES, 1982.

vitulina) and Steller sea lions (Eumetopias jubatus) reach peak numbers during their breeding seasons, and northern elephant seals (Mirounga angustirostris) reach peak abundance on land during their molting season.

Northern fur seals and northern elephant seals spend much of the year at sea, drifting alone or in small groups in the pelagic waters of the California Current. California sea lions, Steller sea lions, and harbor seals, on the other hand, are frequently found on land, and routinely commute from onshore hauling grounds to offshore feeding grounds.

Three of these species breed in central-northern California. Northern elephant seals breed in the winter, from December to early March. Rookeries exist at present on Ano Nuevo Island and on Southeast Farallon Island, and, beginning in 1981, at Cape San Martin on the Big Sur coast. Harbor seals pup and breed in the spring, from late March to June. Pups are born at many locations along the coast, but protected bays and estuaries, such as Humboldt Bay and Drake's Estero, seem to be preferred as rookery sites. Steller sea lions breed in the late spring and early summer, from May to July. Although a few pups are born each year on the Saint George Reef and, probably, at other locations on the north coast as well, the major California Steller sea lion rookeries are on Ano Nuevo Island, Sugarloaf Rock at Cape Mendocino and, on a smaller scale, Southeast Farallon Island.

Counts of pinnipeds on land are always underestimates of total population size, since an unknown segment of the population is at sea. Nevertheless, censuses do indicate those areas that are important to the animals at various times of the year. Figure III.B.4-2 summarizes hauling out season in central-northern California. Haul out areas vary with the species and the season. See Section IV.E.2.d. for pupping seasons. Figure III.B.4-3 summarizes the season distribution of pinnipeds at sea over two years, 1980 and 1981. For more details on the individual species and seasonal aspects, see CCMS (1982).

Sea otters. The southern sea otter is found primarily in coastal kelp forest habitat from Soquel Cove in Monterey Bay south to the Santa Maria River. Since its rediscovery in 1938, the sea otter in California has recovered somewhat from near extinction in the last century. Its resurgence has been monitored by the California Department of Fish and game and the U.S. Fish and Wildlife Service. Apparently, however, the population has changed little in size over the past 10 to 15 years and contains something in excess of 1300 animals.

Concern for the sea otter from OCS oil and gas operations is summarized in the Federal Register Determination of Status Notice: "Therefore, while the chances of an oil spill cannot be predicted, the possibility of such a disaster and its consequences to the sea otter population, coupled with the prospects for increasing oil activity in the area, contributes substantially to the decision to list the population as threatened." (Federal Register Vol. 42, No. 10, p. 2967).

Data specific to impact analysis is discussed in Section IV.E.2.f.

5. Seabirds: The following information on seabird distribution and abundance for central-northern California is excerpted from the Seabird

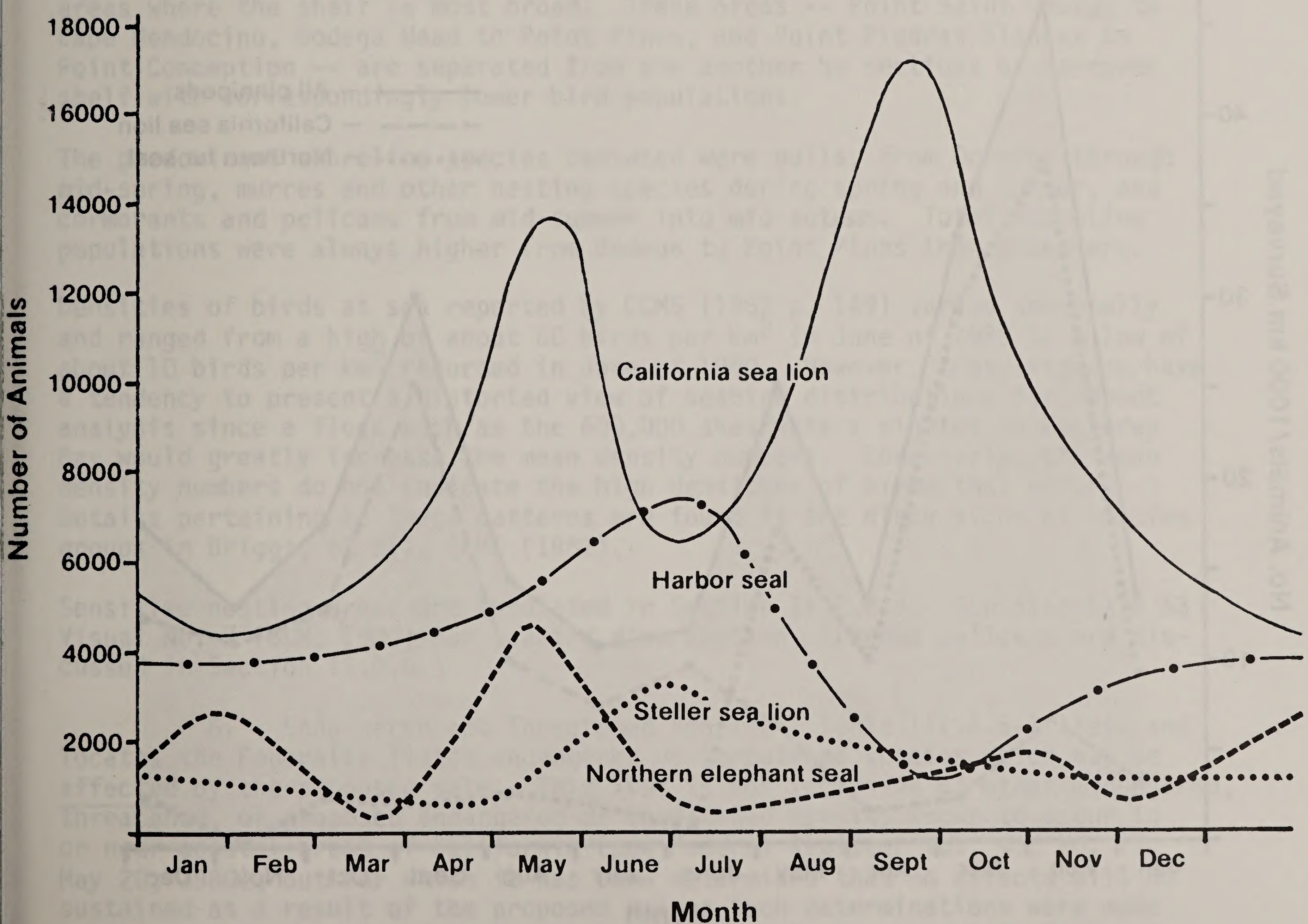

FIGURE III.B.4-2 ANNUAL CYCLE OF PINNIPEDS ON LAND IN CENTRAL-NORTHERN CALIFORNIA (BASED ON DATA COLLECTED FEBRUARY 1980 THROUGH JANUARY 1982). FIGURE FROM CENTER FOR COASTAL MARINE STUDIES, 1982.

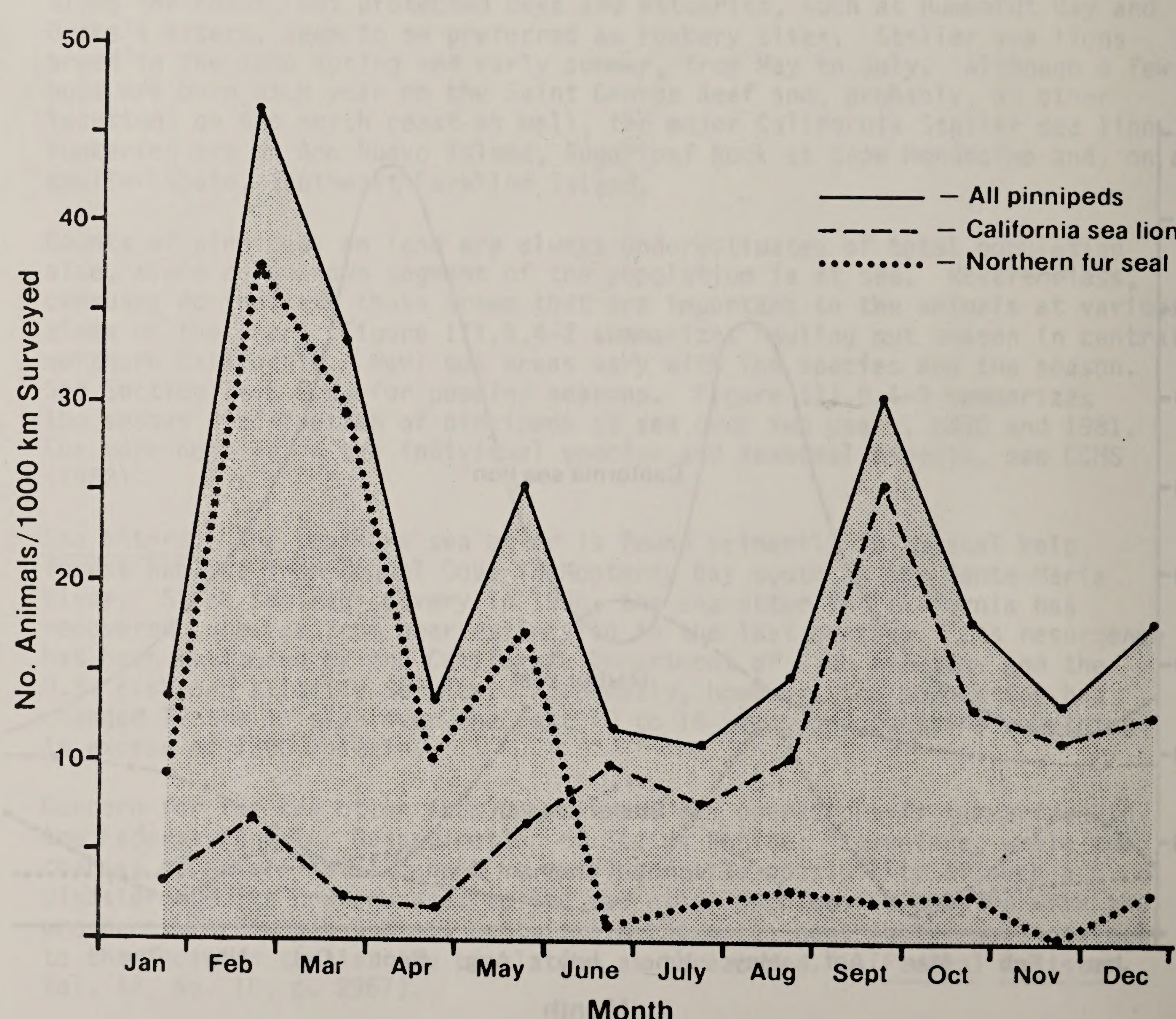

FIGURE III.B.4-3. MEAN RELATIVE OBSERVED ABUNDANCE OF PINNIPEDS SIGHTED AT SEA (NO. ANIMALS/1000 KM OF TRANSECT LINE SURVEYED), FEBRUARY 1980 THROUGH JANUARY 1982. FIGURE FROM CENTER FOR COASTAL MARINE STUDIES, 1982.

section (Briggs, et al., in CCMS 1982) of the second year report on the study being performed for MMS by the Center for Coastal Marine Studies, University of Santa Cruz, hereafter designated the CCMS (1982) Report.

The marine bird fauna of the study area (central-northern California) comprises 93 species dominated both in numbers and in biomass by species that are common throughout the eastern North Pacific from Southern California to the Gulf of Alaska. Seventeen species nest within the study area, comprising an aggregate of ±700,000 individuals (Sowls, et al., 1980) (Table III.B.5-1). The most numerous among these are Common Murres, Cassin's Auklets, Brandt's Cormorants, and Western Gulls; all but the gulls nest in large numbers north of California. Most of the winter residents/visitors and the spring/autumn migrants nest north of California. In contrast, the study area (Central California in particular) is visited during summer by eight species that nest in the southern hemisphere or in Mexico. These species sometimes exceed 1.0 million individuals in combined numbers.

During both 1980 and 1981, most seabirds were seen over continental shelf (0 to 200 m) and slope (200 to 2,000 m) waters; they were concentrated in three areas where the shelf is most broad. These areas -- Point Saint George to Cape Mendocino, Bodega Head to Point Pinos, and Point Piedras Blancas to Point Conception -- are separated from one another by sections of narrower shelf with correspondingly lower bird populations.

The predominant shoreline species censused were gulls, from October through mid-spring, murres and other nesting species during spring and summer, and cormorants and pelicans from mid-summer into mid-autumn. Total shoreline populations were always higher from Bodega to Point Pinos than elsewhere.

Densities of birds at sea reported by CCMS (1982 p. 149) varied seasonally and ranged from a high of about 60 birds per km^2 in June of 1980 to a low of about 10 birds per km^2 recorded in June of 1980. However, these figures have a tendency to present a distorted view of seabird distributions for impact analysis since a flock such as the 600,000 shearwaters sighted in Monterey Bay would greatly increase the mean density numbers. Conversely, the mean density numbers do not indicate the high densities of birds that occur. Details pertaining to these patterns are found in the discussions of species groups in Briggs, et al., CCMS (1982).

Sensitive nesting areas are tabulated in Section IV.E.2.e. See also Sale 53 Visual No. 7 (BLM, 1980) for seabird distribution. (Brown pelicans are discussed in Section II.B.6.)

6. Endangered and Threatened Species: Table III.B.6-1 lists and locates the Federally listed endangered or threatened species which may be affected by the proposed sale. This list is not inclusive of other endangered, threatened, or proposed endangered or threatened species known to occur in or near coastal areas of California (see Federal Register Vol. 45, No. 77, May 20, 1980), but for which it has been determined that no effects will be sustained as a result of the proposed sale. Such determinations were made as part of formal and informal consultation of BLM with the U. S. Fish and Wildlife Service and the National Marine Fisheries Service in compliance with Section 7 of the Endangered Species Act of 1973, as amended for Lease Sale No. 53.

The distribution of whales and sea otters is further discussed in Section III.B.4. Impacts to endangered species are discussed in Sections IV.E.2.f.

TABLE III.B.5-1

SEABIRDS FROM CENTER FOR COASTAL MARINE STUDIES (1982)

Seasonal status of marine birds of the central and northern California OCS. For some species more than one category may be applicable. All shorebirds except phalaropes and most anseriforms (ducks and geese) are excluded.

Breeding species (17)

Fork-tailed Storm-Petrel	Oceanodroma furcata
Leach's Storm-Petrel	Oceanodroma leucorhoa
Double-crested Cormorant	Phalacrocorax auritus
Brandt's Cormorant	Phalacrocorax penicillatus
Pelagic Cormorant	Phalacrocorax pelagicus
Western Gull	Larus occidentalis
Heermann's Gull	Larus heermanni
Forster's Tern	Sterna forsteri
Caspian Tern	Sterna caspia
Least Tern	Sterna albifrons
Common Murre	Uria aalge
Pigeon Guillemot	Cepphus columba
Cassin's Auklet	Ptychoramphus aleuticus
Marbled Murrelet	Brachyramphus marmoratus
Rhinoceros Auklet	Cerorhinca monocerata
Tufted Puffin	Lunda cirrhata
Brown Pelican (nested until 1959, not thereafter; now mostly a summer resident)	Pelecanus occidentalis

Winter residents/visitors (26)

Common Loon	Gavia immer
Arctic Loon	Gavia arctica
Red-throated Loon	Gavia stellata
Western Grebe	Aechmophorus occidentalis
Red-necked Grebe	Podiceps grisegena
Eared Grebe	Podiceps nigricollis
Horned Grebe	Podiceps auritus
Laysan Albatross	Diomedea immutabilis
Northern Fulmar	Fulmarus glacialis
Short-tailed Shearwater	Puffinus tenuirostris
White Pelican	Pelecanus erythrorynchos
Surf Scoter	Melanitta perspicillata
White-winged Scoter	Melanitta deglandi
Black Scoter	Melanitta nigra
Red-breasted Merganser	Mergus serrator
Harlequin Duck	Histrionicus histrionicus
Oldsquaw	Clangula hyemalis
Glaucous Gull	Larus hyperboreus
Glaucous-winged Gull	Larus glaucescens
Herring Gull	Larus argentatus

Thayer's Gull	Larus thayeri
California Gull	Larus californicus
Ring-billed Gull	Larus delawarensis
Mew Gull	Larus canus
Black-legged Kittiwake	Rissa tridactyla
Ancient Murrelet	Synthliboramphus antiquus
Spring/autumn migrants (16)	
Flesh-footed Shearwater	Puffinus carneipes
Buller's (New Zealand) Shearwater	Puffinus bulleri
Mottled Petrel	Pterodroma inexpectata
Brant	Branta bernicla
Red Phalarope	Phalaropus fulicarius
Northern Phalarope	Lobipes lobatus
South Polar Skua	Catharacta maccormicki
Pomarine Jaeger	Stercorarius pomarinus
Parasitic Jaeger	Stercorarius parasiticus
Long-tailed Jaeger	Stercorarius longicaudus
Bonaparte's Gull	Larus philadelphia
Laughing Gull	Larus atricilla
Sabine's Gull	Xema sabini
Arctic Tern	Sterna paradisaea
Common Tern	Sterna hirundo
Horned Puffin	Fratercula corniculata
Summer/autumn (nonbreeding) residents/visitors (8)	
Black-footed Albatross	Diomedea nigripes
Pink-footed Shearwater	Puffinus creatopus
Sooty Shearwater	Puffinus griseus
Manx Shearwater	Puffinus puffinus
Black Storm-Petrel	Oceanodroma melania
Royal Tern	Sterna maxima
Elegant Tern	Sterna elegans
Xantus' Murrelet	Endomychura hypoleuca

TABLE III.B.6-1

FEDERALLY LISTED ENDANGERED OR THREATENED SPECIES MOST LIKELY TO BE AFFECTED BY THE PROPOSED SALE[1]

Species	California Distribution	Status[2]
Birds:		
American Peregrine Falcon (*Falco peregrinus anatum*)	Territories along coastal California. Between Oregon and Mexico.	Endangered
Southern Bald Eagle (*Haliaeetus leucocepalus*)	Mainly in interior California. Some found along the coast and on Santa Catalina Island.	Endangered
California Brown Pelican (*Pelecanus occidentalis californicus*)	Statewide along coast. Breeding only on Anacapa Island and Scorpion Rock in Southern Calif.	Endangered
California Least Tern (*Sterna antillarium browni*)	San Francisco bay to Mexico (breeding). Major colonies in San Diego County and Venice Beach.	Endangered
California Clapper Rail (*Rallus longirostris obsoletus*)	Salt marshes of San Francisco Bay, San Pablo Bay, Napa Marsh and Elkhorn Slough.	Endangered
Mammals:		
Blue Whale (*Balaenoptera musculus*)	Offshore	Endangered
Fin Whale (*Balaenoptera physalus*)	Offshore	Endangered
Gray Whale (*Eschrichtius robustus*)	Nearshore	Endangered
Humpback Whale (*Megaptera novaeangliae*)	Nearshore	Endangered
Pacific Right Whale (*Eubalena glacialis japonica*)	Nearshore	Endangered
Sei Whale (*Balaenoptera borealis*)	Offshore	Endangered

TABLE III.B.6-1 (cont.)

Species	California Distribution	Status[2]
Sperm Whale (Physeter catadon)	Offshore	Endangered
Southern Sea Otter (Enhydra lutris nereis)	Soquel Cove south to Santa Maria River	Threatened
Reptiles:		
Leather-backed Turtle (Dermochelys coriacea sechlegeli)	Rare visitors. Tropical and sub-tropical seas of west coast; some stray as far north as Vancouver Is., British Columbia.	Endangered
Loggerhead Sea Turtle (Caretta caretta)	Rare visitors Offshore	Threatened
Green Sea Turtle (Chelonia mydas)	Rare visitors Offshore	Endangered
Pacific Ridley Sea Turtle (Lepidochelys olivacea)	Rare visitors Offshore	Endangered

[1] As determined through consultation with U.S. Fish and Wildlife Service and National Marine Fisheries Service in compliance with Section 7 of the Endangered Species Act of 1973, as amended for Lease Sale No. 53.

[2] Per Federal Register, 20 May 1980, Vol. 45, No. 97.

7. Estuaries and Wetlands: Treatment of estuaries and coastal wetlands is divided into a general discussion of the habitats and a listing and characterization of estuaries and coastal wetlands found in central-northern California.

General Characteristics of Estuaries. Estuaries are bodies of water, ranging in size from streams to large bays, which communicate with the sea through usually constricted openings. The openings of many estuaries are closed to the sea for certain periods of time. Most estuaries have salinity gradients, being nearly freshwater near the head, where a freshwater stream typically enters, and near the salinity of ocean water near the entrance into the sea at the mouth.

Estuaries are highly productive and important habitats for full time residents and transient species of nearly every major plant and animal taxonomic group. Many birds are dependent upon the highly productive bays for all or part of their life cycles. Some vegetation such as Cordgrass (Spartina sp.), pickleweed (Salicornia sp.) and eel grass (Zostera sp.), occur almost exclusively in estuaries and form salt marshes and eel grass beds, which are among the most productive habitats known in nature. The mud flats are rich in invertebrates, including clams, which are important to sportsfishermen. Fish and mobile invertebrates occur in the channels as well as over mud flats. Estuaries are also very important to the continental shelf ecology in Central California, serving as spawning or nursery grounds for marine fish and invertebrates, habitat for many oceanic birds, and as suppliers of nutrients to the near shore environment.

Estuary habitats can be divided into the six categories shown in Table III.B.7-1. The table summarizes the detailed treatment of these habitats reported by Jones and Stokes (1980) and also summarized in the OCS Sale No. 53 EIS (BLM, 1980). No two estuaries are exactly alike and many smaller stream estuaries do not have every habitat listed in the Table, particularly eel grass beds. The areas in hectares occupied by the major habitats within the larger estuaries are shown in Table III.B.7-2.

The importance of non-living organic matter (detritus) in the flow of energy through the food chain is relatively more important in estuaries than it is in the open ocean. Primary productivity by plants is important in both systems, but detritus in estuaries is so important that estuaries have been said to have a detrital food chain (Darnell, 1961). Detritus is formed in all the habitats listed in Table III.B.7-1, but a surplus amount is formed in the eel grass and salt marsh habitats. This allows surplus detritus to be exported to other habitats of the estuary and nearshore oceanic areas, consequently allowing them to become enriched in food matter. Since salt marshes and eel grass beds, under prolonged exposure (Baker, 1971a), are highly susceptible to oil spills, their consideration in a description of the affected environment becomes important.

Important Estuaries of Central California. Important references concerning estuaries of Central California are the Summary of Knowledge report by Winzler and Kelly (1977), and the characterization report by Jones and Stokes (1980). Estuaries are also covered by U.S. Department of the Interior (1978a, 1979, 1980). Individual estuaries have been given detailed coverage by California Fish and Game (CFG) as part of their wetland series as follows:

TABLE III.B.7-1

ESTUARY HABITAT TYPES, THEIR PRINCIPAL TYPES OF ORGANISMS, AND COMMUNITY ENERGY RELATIONSHIPS

Habitat Type	Principal Tidal Type	Principal Species Type	Primary Production	Detrital Export/Import to Other Habitat Types
Open Water/ Channels	Subtidal	Plankton and swimming (pelagic) fish	Plankton	Imports more than it supplies to other habitats
Rocky Bottom	Intertidal, but both occur especially near entrance	Attached algae and invertebrates	Attached algae	Exports more than it receives from other habitats
Mud Flat	Intertidal	Invertebrates (worms, clams) living within mud	Import surface diatoms	Imports more than it supplies to other habitats
Sand Flat	Intertidal	Invertebrates living in the sand and on it (snails)	Import surface diatoms	Imports more than it supplies to other habitats
Eel Grass Beds	Subtidal	Eel grass; herbivorous invertebrates (snails); attached filter feeding invertebrates	Eel grass	Exports more than it receives from other habitats
Salt Marsh	Intertidal	Salt marsh plants (cordgrass & pickleweed), terrestrial and marine animals	Salt marsh plants	Exports more than it receives from other habitats; most important exporter in estuary

Bolinas Lagoon (1970)
Elkhorn Slough (1972)
Morro Bay (1974a)

Estuaries of ecological concern in Central California are presented in Table III.B.7-2. Table III.B.7-3 gives the estimated width of opening of these estuaries. Criteria for the inclusion of estuaries on this table were major anadromous fish streams (California Fish & Game, 1973) and the Jones and Stokes (1980) tables labeled Areas of Ecological Concern (Volume IV Watersheds and Basins).

An estimation of entrance widths of important estuaries are shown in Table III.B.7-3. The "normal" entrance width was obtained from the openings as mapped on U.S. Gelogical Survey 7-1/2' quad maps. Maximum openings, obtained from the same source, were estimated based on two assumptions: 1) The entire fronting spit bar may be breached (or washed away) during winter and spring flood conditions coupled with high tide and storms; and 2) the entire valley at the mouth may be flooded and open when the entrance lies within a definite valley closely bordered by topographic highs. The former assumption is valid and is typical while the latter rarely occurs, perhaps only occurring during extremely rainy years within several of the estuaries. Therefore, these represent extremely conservative estimates of the maximum flooding possible. The minimum openings and the dimensions of major habitats were obtained from California Fish & Game (1973), Stokes and Jones (1980), Johnson (1972), the State Department of Navigation & Ocean Development (1977), California Fish & Game Wetland Series, Fish & Game personnel (personal communication) or BLM on-site observations. Estuaries were included in the table if they had major habitat areal extent included in California Fish & Game (1973) or appeared to have definite communication with the ocean on the Geological Survey maps.

Table III.B.7-4 shows the total area (in hectares) major habitat for the areas south of San Francisco and the San Francisco estuary complex. The relative ecological importance of San Francisco estuaries is obvious.

Of the habitats listed south of San Francisco Bay, over 90 percent occur in Elkhorn Slough and Morro Bay. The difference in bay openings is discussed in Section IV.E.2.g. (Estuaries impacts).

Morro Bay is located approximately halfway between Los Angeles Harbor and San Francisco Bay. Actually a lagoon, or shallow sound, rather than a true bay, it is about 4 miles long with a maximum width of approximately 1-3/4 miles (California Fish and Game (1974a).

Historically, Morro Bay was a true bay. Deposition of sand formed the existing sand spit, forming the lagoon now called Morro Bay. In pristine times three creeks drained into Morro Bay. Morro Creek with a drainage area of about 15,000 acres, Chorro Creek draining about 30,000 acres and Los Osos Creek with a drainage of about 18,000 acres, all originally entered the bay; but in the course of harbor development, Morro Creek was diverted to the ocean north of Morro Rock. These creeks, however, have not significantly influenced the salinity and temperature of the bay waters.

The salt marsh, tidal mudflats, open water and upland vegetation provide rich and varied habitats which support numerous and varied assemblage of estuarine and terrestrial animals rarely exceeded in other parts of the State (Table

TABLE III.B.7-2

ESTUARIES OF ECOLOGICAL CONCERN IN CENTRAL CALIFORNIA

Estuary	Opening to Sea	Bird Feeding Area (+)	Important Marine Fish Nursery Grounds (I)	Important Anadromous Fish Spawning Route
Central California North of Proposed Sale Area				
Drakes Estero/ Limantour Estero	Open year round	+	+	+ (minor)
Bolinas Lagoon	Open year round	+	+	+ (minor)
Rodeo Lagoon	Intermittently open	+	-	+ (minor)
San Francisco Bay Complex	Open year round	+	+	+
San Gregorio Creek	Intermittently open	+	-	+ (minor)
Pescadero Creek	Intermittently open	+	+	+
Gazos Creek	Intermittently open (most of the year)	+	-	+ (steelhead)
Scott Creek	Intermittently open	+	-	+ (minor)
Baldwin Creek Ponds	Intermittently open	+	-	+ (minor)
Corcoran Lagoon/ Moran Lake	Intermittently open	+	-	+ (minor)
Wilder Creek Pond	Intermittently open	+	-	+
San Lorenzo River	Open year round	+	-	+
Watsonville Slough/Pajaro River	Open year round	+	-	+
Elkhorn Slough Complex	Open year round, constant width maintained by jetties	+	+	-

TABLE III.B.7-2 (cont.)

ESTUARIES OF ECOLOGICAL CONCERN IN CENTRAL CALIFORNIA

Estuary	Opening to Sea	Bird Feeding Area (+)	Important Marine Fish Nursery Grounds (I)	Important Anadromous Fish Spawning Route
Salinas River	Intermittently open	+	- (minor)	-
Carmel River	Intermittently open	+	+	+
Little Sur River	Intermittently open	+	+	+ (steelhead)
Big Sur River	Intermittently open	+	+	+ (steelhead)
Arroyo De Corral	Intemittently open	+	-	+ (steelhead)
Arroyo Grande	Intermittently open	+	_	+ (steelhead)
		Proposed Sale Area		
Pico Creek Estuary	Intermittently open	+	-	+ (steelhead)
Morro Bay	Open year round, constant width maintained by jetties	+	+	-
Santa Maria River	Intermittently open	+	-	-
Santa Ynez River	Intermittently open	+	-	-

TABLE III.B.7-3

WIDTH OF ENTRANCE AND AREAL DIMENSIONS OF MAJOR HABITATS
OF THE IMPORTANT ESTUARIES IN CENTRAL CALIFORNIA
(All number are metric - meters and hectares)

ESTUARY	Width of Entrance: NORMAL	Width of Entrance: MAXIMUM-MIN.	Areal Dimensions of Important Habitat Types: SALT MARSH	MUD FLAT	SAND FLAT	EEL GRASS	OPEN WATER CHANNELS	OTHER
Central California North of Proposed Sale Area								
Drakes-Limantour Estero								
Drakes	340[d]	110[d]-<340m[d]						
Limantour	130[d]	4250 -<130m[d]	81	235			522[b]	
Combined	400-110[d]	4850[d]-<400m						
Bolinas Lagoon								
(narrow)	100[d]	3600 -<100[d]	61	292			150[b]	
(wide)	300	(beachead)						
San Francisco Bay (Point Bonita - Land's End)[d]								
	3600m		1296	16848[b]				
(Golden Gate)	1600m							
San Pablo - Suisun Bays								
S.P.							10449	20218[b] (salt ponds)
Suisun								
San Gregorio Creek	45[d]	200 -< 45[d]						
(Pescadero Cr. - Butano Cr.)								
Pescadero Marsh	100m[d]	240 - 0[d]	20				30[a]	
Laguna Creek	0[d]	200 - 0[d] (beachead)						
Baldwin Creek	0[d]	200 - 0[d] (beachead)						
Wilder Creek Pond	0[d]	150 - 0[d] (beachead)						

TABLE III.B.7-3 (cont.)

ESTUARY	Width of Entrance NORMAL	MAXIMUM-MIN.	Areal Dimensions of Important Habitat Types SALT MARSH	MUD FLAT	SAND FLAT	EEL GRASS	OPEN WATER CHANNELS	OTHER
San Lorenzo River	75-100[d]	90 - 75[d]	1[b]				14[b]	
Woods Lagoon	100[d]	100 -<100[d]						
Schwans Lagoon	10[d]	50 - 10[d]						
Corcoran Lagoon/Moran Lake								
C.L.	10	80 - 10[d]	6.5[b]				4.5[b]	
M.L.	10	50 - 10						
Pajaro River/Watsonville Slough								
(narrow)	300[d]	450 -<300[d]	19[b]				32[b]	
(wide)	450							
Elkhorn Slough								
(inner)	100[d]	120 -<100[d]	583[b]	170[b]			218	77[b,c] (salt ponds)
(outer exit to complex)	150	150 - 150						
Moro Coho Slough	80[d]	80 - 80[d]						
Salinas River (at tide gate)	90[d]	90 - 0[d]						
McClusky Slough	0[d]	100 - 0[d] (drainage into Pajaro River Delta)	22[b]				8[b]	
Carmel River	5-10[d]	100 - 5[d]	15[b]				1.6[b]	
Little Sur River	5-10[d]	100 - 5[d]						
Big Sur River	30[d]	150 -< 30[d]						
Proposed Sale Area								
Morro Bay	200[d]	200 -<200[d]	233[a]	567[b]			263[b]	

TABLE III.B.7-3 (cont.)

ESTUARY	Width of Entrance: NORMAL	Width of Entrance: MAXIMUM-MIN.	Areal Dimensions of Important Habitat Types: SALT MARSH	MUD FLAT	SAND FLAT	EEL GRASS	OPEN WATER CHANNELS	OTHER
San Luis Obispo Creek								
(narrow)	30[d]	100 -< 30[d]	2.4[b]				9[b]	
(wide)	100							
Santa Maria River	3-5[d]	5 - 0[d]	20[b]				6[a]	
Santa Ynez River	0[d]	175 - 0[d]	44.5[b] 10.1				20[b] 23[a]	

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[a] Central-Northern California characterization for BLM-USFWLS by Stokes and Jones (1980).
[b] California Fish & Game (1973) Coastal County Resources.
[c] California Fish & Game Wetland Study Series - see reference.
[d] USGS 7-1/2" Quad Maps.
[e] BLM Field Observations
[f] California Department of Navigation and Ocean Development (1980) - Assessment and Atlas of Shoreline Erosion
[g] Johnson (1972) Tidal Inlets of the California, Oregon and Washington Coasts.

TABLE III.B.7-4

TOTAL AREA OF MAJOR ESTUARINE HABITAT
CENTRAL CALIFORNIA

	Salt Marsh	Tidal Flats*	Open Water
San Francisco Bay	1,396	16,848	---
South of San Francisco	966	737	607

*Mud and sand flats combined.

III.B.7-3, Figure III.B.7-1). Eel grass, which provides a specialized habitat for the black brant, is located primarily in the center of the bay with scattered patches near the mouth (Figure III.B.7-2). Salt marsh plants make a major contribution to the primary productivity of the bay and are used as nesting and loafing areas by many water-associated birds. Ninety-four percent of the salt marsh in the bay is located at the mouths of Chorro and Los Osos creeks (Figure III.B.7-1). The remainder is scattered along the edges of the bay and on Grassy Island. Salt marsh plants, by means of photosynthetic activity and nutrient storage make a major contribution to the primary reproductivity of the bay. The tidal mudflats host abundant populations of invertebrate organisms that become food for many fish and wildlife species in the bay ecosystem.

Morro Bay is an important bird area, including black brant, great blue herons and over seventy species of water associated birds (see Section III.B.5). Sixty-six species of finfish have been identified from the bay. Most numerous are northern anchovies, shiner perch and black perch. Eleven species are considered resident and fifteen other species apparently use the bay during some stage of their life cycle (see Section III.B.3). The bay teems with invertebrates and supports a commercial oyster operation. Nineteen species of clams are present. Most abundant are Washington, gaper and geoduck clams.

Four large marine mammal species have been seen in Morro Bay; the harbor seal, California sea lion, Steller's sea lion and sea otter. The most common is the harbor seal, which is known to give birth to young in the bay (see Section III.B.4).

Two endangered species receive much attention locally. The peregrine falcon nests on Morro Rock, and the Morro Bay kangaroo rat is indigenous to an area at the southern end of the bay (see Section III.B.6).

Appropriative use of fish and wildlife at Morro Bay includes duck and black brant hunting. Perch, flounder, jacksmelt, lingcod and cabezon are some of the fish caught from skiffs, piers, revetments and breakwaters. Crabbing and clamming also are significant appropriative use of the bay's natural resources and oysters are raised commercially (see Sections III.B.C.5 and III.C.6).

Scientific and educational use of Morro Bay is another important non-appropriative use of the bay's resources. The most significant of this type of use is made by the students from California State University, San Luis Obispo, but students and instructors from various other universities and colleges in California also use the bay. The bay is considered of such importance that it has been nominated to become a National Marine Sanctuary.

8. Areas of Special Concern: There are three types of designated areas of special concern which are of biological importance. They are: 1) ecological reserves, 2) marine life refuges, and 3) area(s) of special biological significance (ASBS). These are legally defined and controlled by the State of California. Ecological reserves and marine life refuges are very similar; however, there are more restrictions and controls in an ecological reserve. The purpose of the refuges and reserves is to reduce the abuse and waste of the State's tidepool resources by restricting general collecting of all animals living in tide pools and other areas between the high tide mark and 1,000 feet below the low tide mark. Additionally, the California Sea

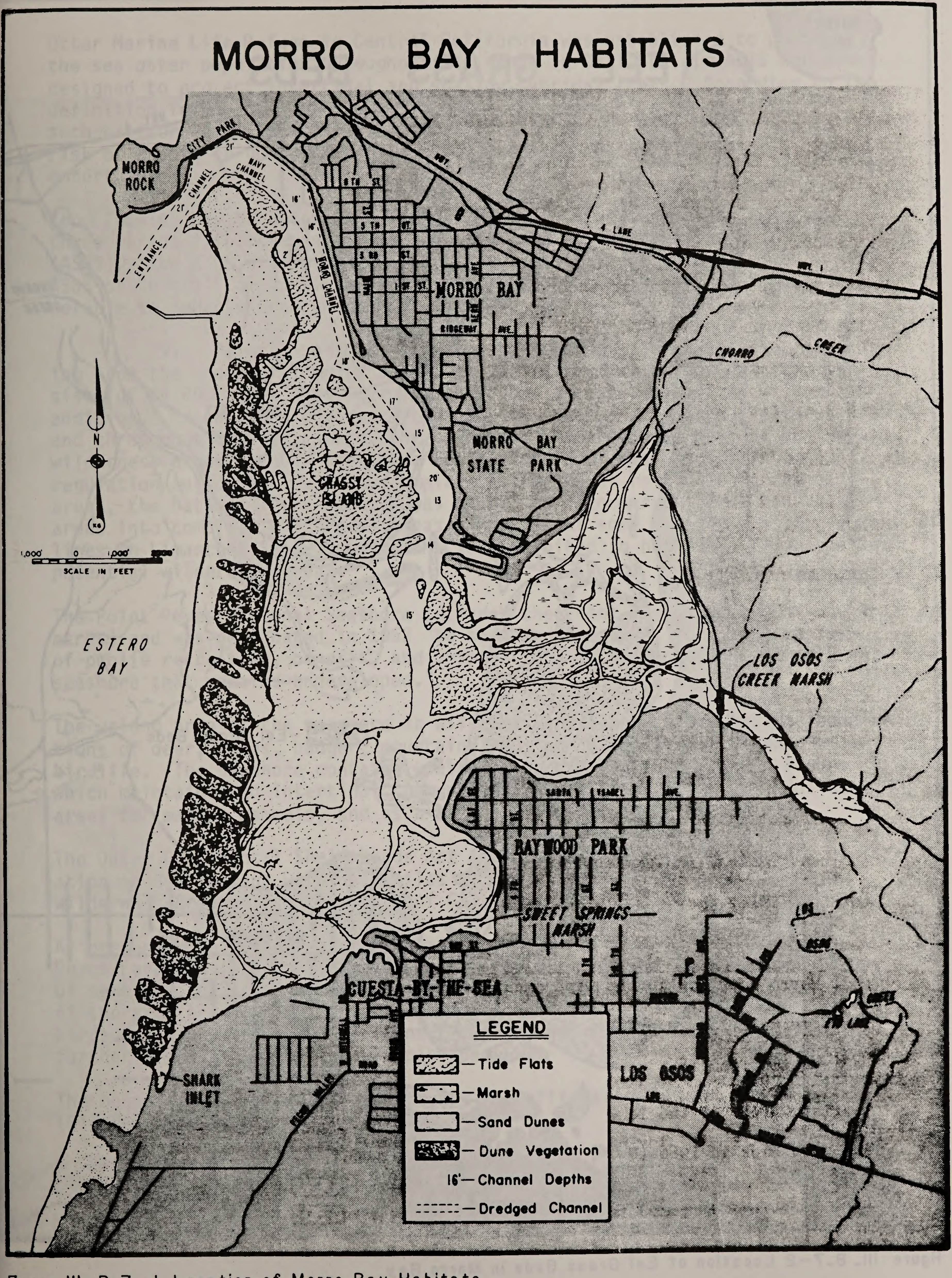

Figure III. B.7-1 Location of Morro Bay Habitats

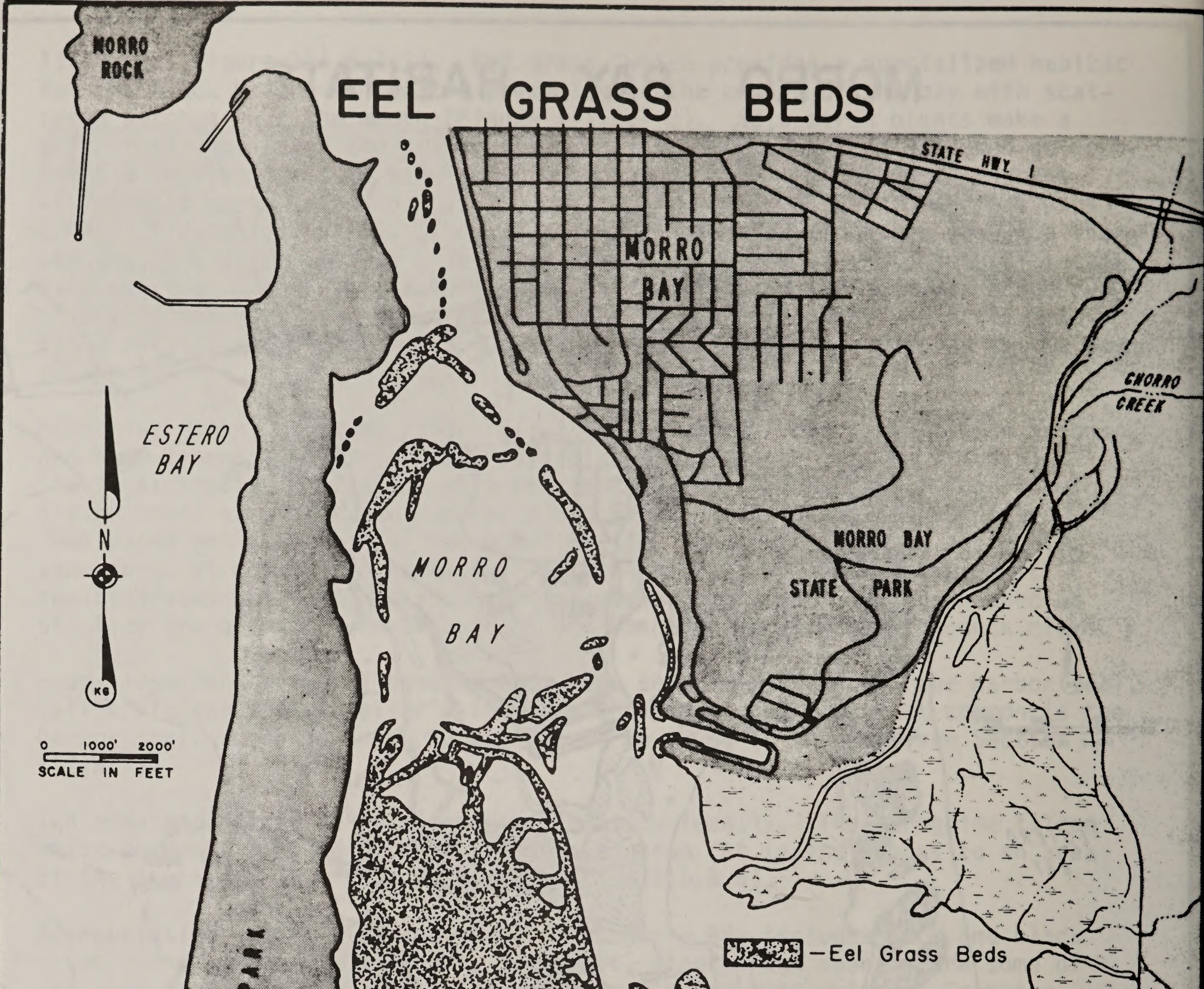

Figure III. B.7—2 Location of Eel Grass Beds in Morro Bay

Otter Marine Life Refuge in Central California was established to protect the sea otter population throughout its range in California. ASBS are also designed to protect intertidal and shallow subtidal areas. According to the definition for ASBS, they are areas containing biological communities of such extraordinary, even though unquantifiable, value that no acceptable risk of change in their environments as a result of man's activities can be entertained.

From Tomales Bay to Point Conception, there are nine ecological reserves, three marine life refuges and 15 areas of special biological significance (ASBS). The ASBS of Central California are listed in Figure III.B.8-1. The ASBS of Central California together with Southern California ASBS most vulnerable to impacts from this sale are shown in Table III.B.8-1.

9. Point Reyes/Marine Sanctuaries: The wilderness area, extending from the mouth of Tomales Bay to the Point Reyes Bird Observatory, consists of 24,200 acres of wilderness and 8,530 acres of potential wilderness addition. Extending along nearly the entire coastline of the wilderness area and throughout Drake's Estero, the potential wildernesses were not designated wilderness areas because the State of California maintains certain fishing regulation authority. Lacking complete authority of regulation of these areas, the National Park Service was unable to incorporate these coastal areas into complete wilderness areas. Outside of some already existing powerlines on Limantour Spit, development is prohibited in both the wilderness and potential wilderness areas.

The Point Reyes National Seashore includes the Point Reyes peninsula (64,546 acres) and was designated in 1962 "to save and preserve, for the purposes of public recreation, benefit, and inspiration, a portion of the diminishing seashore that remains undeveloped."

The upland area of the seashore is wild and undeveloped and maintains populations of deer, foxes, badger, mountain lion, and a variety of rodents and birdlife. The seashore contains unaltered rocky shores and sandy beaches which maintain rich intertidal communities, serve as breeding and haul out areas for marine mammals, and as a nesting area for seabirds.

The Outer Continental Shelf Lands Act Amendments of 1978 prohibits any exploration or development within 15 miles of the boundaries of the Point Reyes Wilderness Area unless the State of California allows it.

At present, one marine sanctuary exists in Central California. The Point Reyes/Farallon Islands Marine Sanctuary contains the largest breeding colony of seabirds in California and is an important pinniped rookery. The waters of the area are highly productive and are an important foraging area for the birds and pinnipeds. See Sections IV.E.2.d. and 2.e. and BLM (1980) for further discussion on birds and pinnipeds.

The boundaries of the marine sanctuary are officially defined as follows (Figure III.B.8-1):

> "The Sanctuary consists of an area of the waters adjacent to the coast of California north and south of the Point Reyes Headlands, between Bodega Head and Rocky Point and the Farallon Islands (including Noonday Rock), and includes approximately 948 square nautical miles.

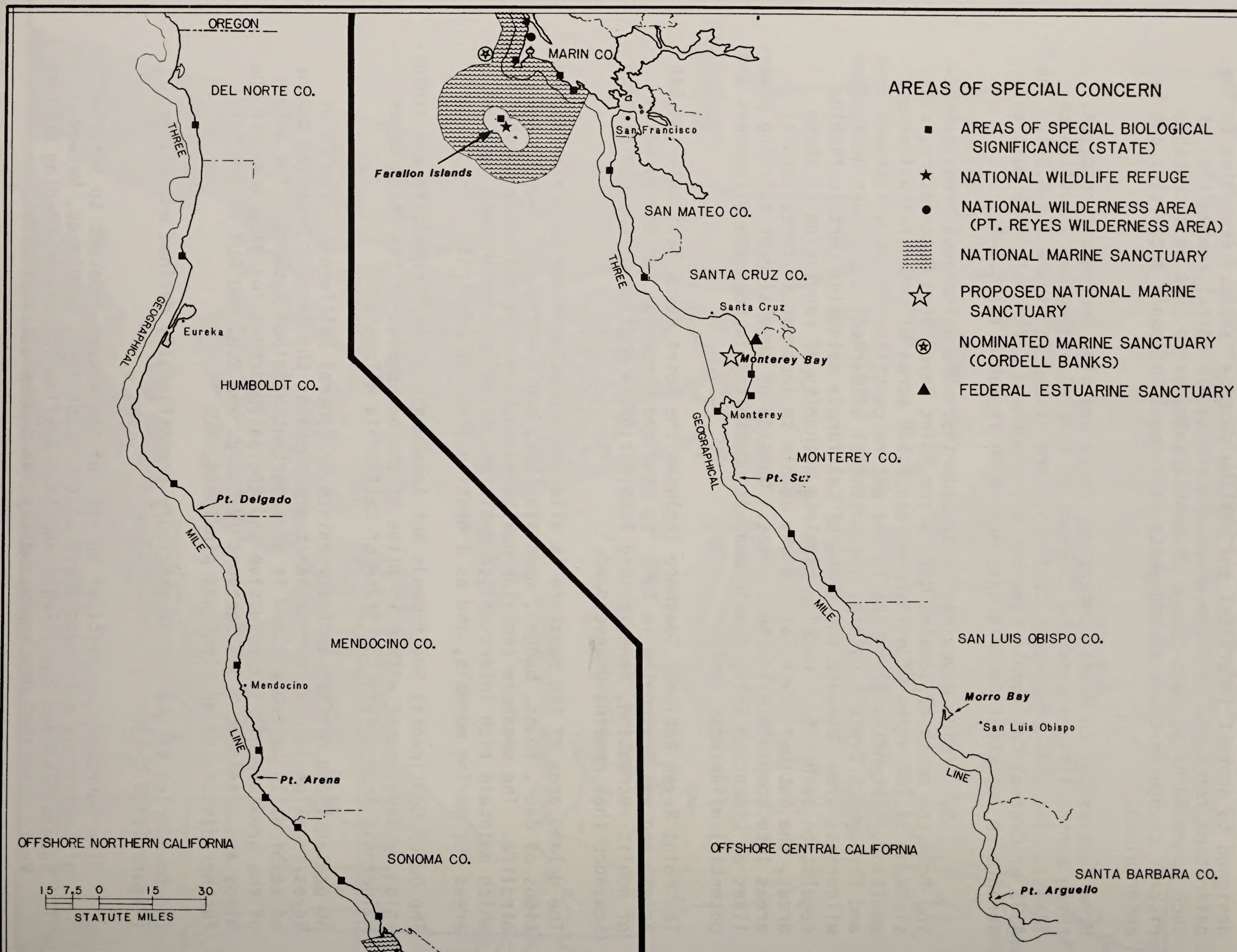

FIGURE III.B.8-1. AREAS OF SPECIAL CONCERN AND MARINE SANCTUARIES

TABLE III.B.8-1

AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE (ASBS) IN CENTRAL CALIFORNIA

Central California North of Proposed Sale Area

1. Del Mar Landing Ecological Reserve
2. Gerstle Cove
3. Ocean Area Surrounding the Mouth of Salmon Creek
4. Bodega Marine Life Refuge
5. Farallon Island
6. Point Reyes Headland Reserve
7. Bird Rock
8. Double Point
9. Duxbury Reef Rserve
10. James V. Fitzgerald Marine Reserve
11. Ano Nuevo Point and Island
12. Pacific Grove Marine Gardens Fish Refuge and Hopkins Marine Life
13. Carmel Bay
14. Point Lobos Ecological Reserve
15. Julia Pfeiffer Burns Underwater Park

ASBS MOST LIKELY AFFECTED BY SALE NO. 73 IN SOUTHERN CALIFORNIA

Proposed Sale Area

San Miguel, Santa Rosa, and Santa Cruz Islands
San Nicolas Island and Begg Rock
Santa Barbara Island, Santa Barbara County and Anacapa Island
Mugu Lagoon to Latigo Point
Santa Catalina Island - Subarea One, Isthmus Cove to Catalina Head
Santa Catalina Island - Subarea Two, North End of Little Harbor to Ben Weston Point
Santa Catalina Island - Subarea Three, Farnsworth Bank Ecological Reserve
Santa Catalina Island - Subarea Four, Binnacle Rock to Jewfish Point

The shoreward boundary follows the mean high tide line and the seaward limit of Point Reyes National Seashore. Between Bodega Head and Point Reyes Headlands, the Sanctuary extends seaward 3 nm beyond State waters. The Sanctuary also includes the waters within 12 nm of the Farallon Islands, and between the Islands and the mainland from Point Reyes Headlands to Rocky Point. The Sanctuary includes Bodega Bay, but not Bodega Harbor."

Oil development activities are not allowed in the Point Reyes/Farallon Islands Marine Sanctuary.

Cordell Banks near San Francisco has been nominated as a possible marine sanctuary, but no decision has been made concerning its eventual incorporation into the marine sanctuary system. As indicated in Section III.B.1, Cordell Banks is a shallow rise from the ocean floor which supports a rich rocky bottom community (including purple coral Allopora californica) and large populations of fish. (Schmieder, 1982)

Morro Bay in San Luis Obispo County has also been nominated for marine sanctuary status. See Sections III.B.5,6,7 and C.5.

An active candidate for a marine sanctuary is Monterey Bay and surrounding waters. The boundaries on this proposed sanctuary are still being discussed (Ralph Lopez, personal communication). Monterey Bay is proposed because of the rich bottom area highlighted by a submarine canyon.

The Golden Gate National Recreation Area (GGNRA) run by the National Park Service has natural resources that could be affected by an oil spill (see Section IV.C.1). These include Brown pelican feeding and roosting areas, salmon spawning streams, the last Bay Area site of Eucyclugobius newberryi (tidewater goby) in Rodeo Lagoon, harbor seal haul-out areas at Point Bonita, Bolinas Lagoon and Alcatraz Island, Bird Rock, a nesting and roosting area for pelagic birds, and Seal Rocks, a haulout area for California and Stellar sea lions. This diversity of wildlife is especially unique and important since it is adjacent to a large urban area.

In Southern California, the Channel Islands Marine Sanctuary could be affected as the result of Proposed Sale No. 73.

The objectives of the marine sanctuary are to preserve a unique and strategically located ecosystem (intertidal, subtidal benthos, pinnipeds, seabirds, recreation, and cultural resources), to encourage scientific research, and to enhance public awareness of the sanctuary resources. The boundaries of this sanctuary are defined as the ocean area from the mean high tide line to a distance of 6 nm around San Miguel, Santa Rosa, Santa Cruz, Anacapa and Santa Barbara Islands. The islands themselves are not part of the sanctuary although they are a national park. The California Department of Fish and Game and the National Marine Fisheries Service are responsible for the regulation of fishing within the sanctuary boundaries.

The Channel Island National Marine Sanctuary contains some highly productive waters and bottom communities, including an area of purple coral. Because of

the high productivity, sanctuary waters are important for forage by the many important biological communities and species of the area. This site also contains highly productive kelp beds, commerically and recreationally valuable fish and shellfish, and several transition zone species.

The northern shore of Santa Rosa Island contains a very productive rocky intertidal community that has large populations of the brown algae Pelvetia sp. and isolated areas of dense populations of black abalone.

The Channel Islands support a large and diverse community of marine mammals. San Miguel Island is unique in that it is the only island in the northern hemisphere on which six species of pinnipeds haul out. There are some 32 species of marine mammals in the area, including the northern elephant seal, California sea lion, harbor seal, northern fur seal, dolphins, porpoises, and minke, gray and pilot whales. In addition, the area serves as habitat for breeding seabirds. Major rookeries are found on San Miguel and Santa Barbara Islands and offshore rocks.

The endangered brown pelican has a large nesting area on Anacapa Island which, outside of an intermittent nesting of a few pairs on Santa Barbara Island, is its only nesting area in Southern California.

C. Socioeconomic Environment

1. Coastal Economy: San Luis Obispo and Santa Barbara Counties have economies that are strong in tourism, agriculture, and fishing. Government is also a significant contributor to the economy of study area. Tourist related activities are found primarily along the coast and around the major population centers.

The study area economy is also enhanced by the petroleum industry in both extraction and refining. Onshore employment is expected to remain constant over the life of the project, however, changes in the oil market, the quality of oil found offshore, and general economic conditions could result in a change in the industry's employment levels and structure.

The September 1982 labor force consisted of more than 230,400 people, of which 17,950 were unemployed. The unadjusted unemployment rate of 7.8 percent is much lower than the 9.7 percent experienced statewide for the same period.

The following table shows wage and salary employment for the study area. Wage and salary employment is the number of people who receive compensation from businesses. Wage and salary employment is one indicator of the economic structure of an area.

Central California Wage and Salary Employment (1981)

Sector	
Total Wage and Salary	182,750
Agricultural Wage and Salary	9,850
Nonagricultural Wage and Salary	172,850
Mining	1,850
Construction	8,050
Manufacturing	21,550
Transportation & Public Utilities	8,600
Wholesale Trade	5,400
Retail Trade	36,750
Finance, Insurance, Real Estate	7,800
Services	44,100
Government	38,750

Table III.C.1-1 provides information on the expected level of the labor force between 1980 and 2010.

Table III.C.1-2 shows information on the level of earnings in the economic sectors anticipated to be impacted by Proposed Sale No. 73. The level of earnings in Table III.C.1-2 are the base from which the level of impacts have been measured.

2. Demography: The study area includes the counties of San Luis Obispo and Santa Barbara for the purpose of demographic analysis and description. The demographic characteristics which have been used to describe and analyze the study area are the subjects of Tables III.C.2-1 and -2. The characteristics of household size, minority population, home ownership, and average age were selected because of their ability to define social structure.

Population in the study area rose by 88,386 persons from 1970 to 1981 or an increase of 23.89 percent in 11 years. Home ownership in the study area is below both the State and national rates. The average household size is 1.1 percent smaller than the State average and 6.6 percent smaller than the national average. Table IV.J.3.b-1 shows that population in the study area is expected to increase by 43.7 percent between 1980 and 2020.

TABLE III.C.1-1

PROJECTED LABOR FORCE FOR CENTRAL CALIFORNIA

1980*	1990†	2000†	2010
192,000	228,300	258,000	285,800

*State of California Health and Welfare Agency Employment Development Dept.

†MMS Estimates, 1983.

TABLE III.C.1-2

SELECTED ECONOMIC COMPONENTS FOR CENTRAL CALIFORNIA
(IN THOUSANDS OF 1980 DOLLARS)

Economic Component	1980	1985	1990	2000	2020
Transportation, Communications, Public Utilities	184,800	224,400	272,600	397,300	747,400
Wholesale, Retail Trade	485,800	533,500	625,200	869,800	1,517,000
Finance, Insurance, Real Estate	143,600	180,800	227,500	354,500	741,300
Services	725,200	892,400	1,098,200	1,656,600	3,309,400
Total Earnings	2,951,000	3,527,000	4,216,800	6,051,800	11,211,300

Source: OBERS projections, 1972. U.S. Water Resources Council, Washington, D.C.

TABLE III.C.2-1

1970, 1980, AND 1981 POPULATION FOR
CENTRAL CALIFORNIA COUNTIES

	1970*	1980*	1981**	% Change 1970-1981
San Luis Obispo	105,690	155,345	158,900	50.33
Santa Barbara	264,324	298,660	299,500	13.32
Total	370,014	454,005	458,400	23.89
California	19,957,715	23,668,562	24,013,200	20.30

*U.S. Bureau of Census
**California Department of Finance, May 1, 1981

TABLE III.C.2-2

SELECTED POPULATION CHARACTERISTICS
OF CENTRAL CALIFORNIA

Central Coast	Average Persons Per Household	% Ethnic or Racial Minority	% Owner Occupied Housing	Average Age
Monterey	2.85	40.1	49.0	27.6
San Luis Obispo	2.50	14.6	52.4	29.9
Santa Barbara	2.62	24.8	50.4	29.7
Santa Cruz	2.54	15.8	52.8	30.6
Study Area	2.65	26.1	50.9	29.3
California	2.68	33.4	52.0	29.8
United States	2.75	20.3	58.6	30.0

Source: U.S. Bureau of Census 1980 and Minerals Management Service

3. Public Services and Facilities: This discussion of public services and transportation is limited to a discussion primarily of the water supply, wastewater treatment facilities, and secondarily of transportation systems (roads, railroads and airports) and electrical power supply capabilities. Other services and facilities (e.g., schools, parks, police and fire protection) are not discussed. These facilities and services are impacted most by population increases. As discussed in III.C.2 and IV.E.3.a, population increases associated with OCS development will be insignificant (less than 0.5%) when considering overall projected population growth, and would have little to no effect on any increased need for these services and facilities.

Water Supply. Water supply in the proposed sale area ranges from adequate (able to provide for current and future needs until the next century) to inadequate (significant amounts of needed additional water are either purchased from other sources or acquired by overdrafting the ground water basins).

San Luis Obispo County (SLO) - Water for the City of Morro Bay is provided from wells in the Morro and Chorro Creek drainage basins. Current maximum safe yields are estimated at 3,944 acre feet for both urban and agricultural uses. Supplemental water supplies have been contracted from Whale Rock Reservoir in the past. In response to the water shortages resulting from the draught years of the late seventies, the City of Morro Bay initiated a water policy requiring a 20% reduction in water usage, a permit approval policy allowing only those uses that are similar to current and historic uses and subdivision and annexation ban. In November 1976, local voters rejected a bond issue for construction of the necessary facilities to supplement Whale Rock Reservoir with water from Nacimiento Reservoir. Costs were felt to be too high for the City of Morro Bay to afford alone. Through effective water management, Morro Bay should be able to provide for the current population and for future population growth, if growth projections are accurate based on a study done by Brown and Caldwell (Table III.C.3-1) (SLO, 1981a).

The South Bay area (the area adjacent to and south of Morro Bay) has a serious water supply problem. The population of South Bay increased 197% between 1970 and 1980. Potable water is currently provided from wells in the Los Osos basin. Safe yield estimates range from 1,300-1,800 acre feet up to 3,100 acre feet. The current extraction levels are resulting in indications of water quality deterioration. The State Regional Water Quality Board has identified the need for sewering in this area. This would remove a large source of water basin recharge that currently comes from septic tanks. Agricultural water needs are a competing demand on the water supply of the Los Osos basin. The San Luis Obispo County Master Water and Sewerage Plan (1972) projects a 500 acre feet per year need for importation of water by the year 2000 or a 1,700 acre feet per year import need if sewers are installed given the projected population increases (Table III.C.3-2). The Master Water and Sewerage Plan also suggested three alternatives to meet the year 2000 water needs for the north (outside the sale area) and central coast areas. These are: 1) developing a pipeline from Nacimiento to Whale Rock Reservoir, 2) construction of a reservoir on Arroyo de la Cruz, and 3) development of Santa Rosa Dam and Reservoir. Additional water supplies for the Estero planning area (Cayucas, Morro Bay, South Bay) are available from the 25,000 acre feet entitlement from the State Water Project (SWP). San Luis Obispo is not currently using its entitlement as no pipeline exists from the SWP to San Luis Obispo County.

TABLE III.C.3-1

SELECTED SAN LUIS OBISPO COUNTY POPULATION PROJECTIONS

	Morro Bay	South Bay	Avila Beach	Pismo Beach	Arroyo Grande	Grover City	Oceano	Nipomo
1979	8,685	9,593	386	5,116	10,343	8,350	3,976	5,296
1980	8,876	10,381	396	5,341	10,674	8,534	4,126	5,487
1990	10,926	14,220	442	6,653	13,076	10,598	5,137	6,881
2000	13,047	17,334	488	7,782	15,645	12,680	6,146	8,233

Other South County Urban and Rural Areas	
1979	3,925
1980	4,043
1990	5,070
2000	6,066

Sources: Local Coastal Program, Land Use Plans, Estero Planning Area, San Luis Bay Planning Area, South County Planning Area; Adopted by Board of Supervisors 10/13/81

TABLE III.C.3-2

WATER SUPPLY NEEDS
(acre feet/year)

	Morro Bay	South Bay	Avila Beach	Pismo Beach	Arroyo Grande	Grover City	Oceano	Nipomo
1979	1,737	1,919	77	1,023	2,069	1,670	795	1,059
1980	1,775	2,076	79	1,068	2,135	1,707	825	1,097
1990	2,185	2,844	88	1,331	2,615	2,120	1,027	1,376
2000	2,609	3,467	97	1,556	3,129	2,536	2,536	1,647

Other South County Urban and Rural Areas	
1979	785
1980	809
1990	1,014
2000	1,213

1. Calculated at 0.2 acre feet per person per year

Sources: Population figures - San Luis Obispo Local Coastal Program, Land Use Plan; Estero, San Luis Bay and South County Planning Areas, Adopted October 13, 1981

Lopez Reservoir currently provides most of the water used by the San Luis Bay cities of Avila Beach, Pismo Beach, Arroyo Grande, Grover City and Oceano. Currently 4,530 acre feet per year are available for urban uses from Lopez Reservoir and other basins. Pumping of ground water from the Arroyo Grande basins are used to supplement Lopez water supplies. A 1979 State Department of Water Resources Report notes that water quality is deteriorating in some portions of the basin but that there is ample water stored above sea level to meet demands until 1990. Long range needs require a comprehensive plan of ground water management.

Portions of the San Luis Obispo Creek groundwater basin are located near Avila Beach. The Avila Beach County Water District abandoned use of their wells in the basin in 1974 and are entirely dependent on water from Lopez Reservoir. Pismo groundwater basin has a storage capacity of 30,000 acre feet with an annual recharge of 2,000 acre feet per year. Current annual use is 2,100 acre feet per year. The Arroyo Grande groundwater basin is divided into three sub-units; the Arroyo Grande-Tri-City Mesa, the Nipomo Mesa and the Santa Maria Valley. Groundwater levels have risen in the Tri-Cities Mesa - Arroyo Grande Plain subunit since urban areas are using their Lopez Reservoir allotments. Agricultural uses are currently the main water users.

Avila Beach has a 65 acre feet per year allotment of Lopez Reservoir water. Without any additional entitlements of water from Lopez Reservoir and with projected population growth the water supply will be at or exceed capacity when the population reaches 445 (SLO 1981a).

Pismo Beach, Grover City, and Oceano are using water from Lopez Reservoir and supplementing their needs from the Arroyo Grande groundwater basin. Pismo Beach currently has a total Lopez water entitlement of 886 acre feet per year. In addition "surplus" Lopez water is purchased and water is pumped from the groundwater basin. Pismo Beach consumption was 1,055 acre feet in 1978-1979. An additional 501 acre feet per year would be required to supply the anticipated population in the year 2000 (Table III.C.3-2). Grover City has a Lopez water allotment of 800 acre feet per year and provides supplemental water needs from pumping the groundwater basin. Total water consumption for 1978-1979 was 912 acre feet. By the year 2000 Grover City will have to supply 2,536 acre feet per year to its projected population (Table III.C.3-2). The community of Oceano has a 303 acre feet per year entitlement through the Oceano Community Service District. Additional water is pumped from the groundwater basin. The total use for 1978-1979 was 398 acre feet. By the year 2000 the water supply available to support the projected population will need to be 1,229 acre feet per year (Table III. C.3-2). The city of Arroyo Grande has a Lopez water allotment of 2,290 acre feet per year. In addition the city maintains wells to tap the Arroyo Grande groundwater basin should that become necessary. Total water use in 1978-1979 was 1,866 acre feet. Projected water needs to supply the population in the year 2000 would be 3,129 acre feet (Table III.C.3-2). Currently Arroyo Grande is not utilizing the entire Lopez allotment and is not tapping the groundwater basin. There is some indication that groundwater quality in the Arroyo Grande basin is decreasing. This may be a factor in the future when Arroyo Grande may need to draw upon the groundwater basin to supplement the Lopez water allotment (SLO, 1981b).

The South County area (Nipomo, and other small urban centers) is dependent upon water drawn from the Arroyo Grande Groundwater Basin. The Nipomo Mesa subunit is currently being overdrafted with an estimated annual inflow of 4,800 acre feet and an outflow of 6,250 acre feet. Approximately 3,300 acre feet is lost to adjacent subunits of the basin and to the ocean. The Department of Water Resources Study estimates that the basin should have adequate water to at least the year 2000. The study also identified the existence of a large, 3,000,000 acre feet offshore aquifer and that utilization of this aquifer may provide the necessary water for future needs. The use of this aquifer could also result in salt water intrusion making development of the aquifer speculative. Water lost to other subunits could be captured if the water table of the Nipomo Mesa subunit was lowered. This would result in some existing wells going dry (SLO, 1981c).

In summary, water supplies in the coastal areas of San Luis Obispo are meeting the current population needs with existing sources of water. Groundwater quality deterioration is a potential problem in two basins, Los Osos and Arroyo Grande. The City of Morro Bay, Avila Beach, Arroyo Grande, and the urban areas of Nipomo Mesa have adequate water to accommodate some growth given the growth projections (Table III.C.3-1 and Table III.C.3-2). The other Bay cities, Pismo Beach, Grover City and Oceano, are supplementing their Lopez water entitlement with groundwater. Options for improving the long term availability of water are: 1) groundwater basin management, 2) development of dams and reservoirs in northern San Luis Obispo, 3) piping water from Nacimiento Reservoir to Whale Rock Reservoir, or 4) developing a tie-in to the State Water Project to utilize the entitlement (SLO, 1981,a,b,c).

Santa Barbara County - Blayney-Dyett (1981) has discussed the water supply of Santa Barbara County. The following is excerpted from that report.

Most of the county's water is from groundwater basins. These basins, excluding Cuyama Valley, have a storage capacity of 3.3 million acre feet and a safe annual yield of 129,600 acre feet. The Santa Maria Valley, Lompoc-Vandenberg area and Santa Ynez receive all or the majority of their water supply from groundwater basins.

Reservoirs are the major source of water for the urban areas of the coastal Santa Barbara County. The reservoirs have an estimated annual yield of 38,650 acre feet. The Cachuma Reservoir is the source of water for the South Coast area. Current estimates of safe yield are 23,950 acre feet per year. South Coast cities and the Santa Ynez River Water Conservation District ultimately will have entitlement to 32,000 acre feet per year. Gibraltar Reservoir is owned by the City of Santa Barbara and has a water yield of 9,400 acre feet per year. Siltation, if no corrective measures are undertaken, could reduce the water supply to 1,400 acre feet per year by the year 2000. Above the Gibraltar Reservoir is the Jameson Reservoir owned by the Montecito County Water District. Storage capacity is 6,750 acre feet with an estimated yield of 1,700 acre feet.

The North Coast of Santa Barbara County is rural, with a large portion of the coastal zone controlled by Vandenberg Air Force Base. Groundwater basins are the source of water for this area. The North County area is almost entirely dependent upon groundwater supplies. Santa Maria Valley extracted 65,800 acre feet in 1975 with an overdraft (extracting more than is replenished through natural sources) of 16,130 acre feet. The overdrafting is estimated to increase to 36,820 acre feet per year by the year 2000. The Lompoc-Vandenberg AFB area is also dependent upon groundwater for water supplies. Use in 1975 was 28,550 acre feet with an overdrafting of 7,270 acre feet. This overdrafting is estimated to increase to 20,140 acre feet per year by the year 2000. The Santa Ynez area removed 20,900 acre feet in 1975 from the groundwater basin. The Santa Ynez County Water Conservation District has an entitlement of 3,300 acre feet per year from Cachuma Reservoir. The South coast, Carpinteria to Point Conception, used 34,870 acre feet of water from reservoirs in 1975 and 14,380 acre feet from groundwater basins. In 1975 the area had a surplus of 1,330 acre feet but by the year 2000 it will have a 13,332 acre feet per year water supply deficit.

County wide water use in 1975 was 191,140 acre feet (excluding Cuyama Valley) with an overdraft of 23,000 acre feet. The deficit is caused mainly by the demand for water by agriculture, about 70% of the County's water demand. The Santa Barbara County Water Agency predicts a water supply deficit of 73,600 acre feet per year by the year 2000.

Options for correcting the overdraft situation include constructing new dams, enlarging existing ones, reservoir and groundwater basin management, watershed management, reuse of wastewater, or construction of a pipeline to use the County's State Water Project entitlement of 57,700 acre feet per year (Blayney-Dyett, 1981).

Wastewater Treatment Capacity - Wastewater sewage treatment is accomplished by septic tanks and leach lines throughout most of the rural Central California coastal zone. Sewage treatment systems are limited to urbanized areas. Urban municipal plant capabilities range from adequate (able to accommodate 10-year growth projections) to barely adequate (within sewer hookup moratoria recently lifted).

San Luis Obispo County - The City of Morro Bay jointly owns with the City of Cayuces a secondary treatment plant and a 16-inch ocean outfall. Morro Bay has an entitlement to 60% of the 1.7 million gallon per day (mgd) capacity. A federal grant has been received to nearly double the capacity of the plant. This would accommodate an estimated 10 year growth period. Because of water quality problems the ocean outfall line has been extended to 4,000 feet off-shore at a depth of 60 feet. Reclaimed treated wastewater is being considered for irrigation uses. A moratorium of new system hookups was recently lifted in the city of Morro Bay.

The South Bay area is served by collective or individual septic tanks. The County's Master Water and Sewerage Plan recommends the use of a sewage treatment plant to prevent groundwater degradation and to handle anticipated volume increases. Development and use of a sewage treatment plant would effect the groundwater basin as considerable amounts of treated water are reintroduced into the basin from leech lines and septic tanks (SLO, 1981a).

The Avila Beach County Water District provides sewage treatment service to the Avila Townsite. Plant capacity is 200,000 gallons per day (gpd) with current flow at 50,000 gpd. Treated effluent is discharged into San Luis Bay (SLO, 1981b).

The Pismo Beach sewage treatment plant has a current capacity of 1.2 mgd and average daily flow of 0.9 mgd with peak period flows up to 1.8 mgd. Tourism is the main reason for the peak flow rates. Improvements to expand the capacity to 2.5 mgd are planned for completion by 1987. Because of storm damage to the previous ocean outfall line, the City of Pismo Beach has constructed a tie-in line to the South County District's outfall line (SLO, 1981b).

The South San Luis Obispo County Sanitation District provides secondary treatment for Grover City, Arroyo Grande and Oceano. The plant has a capacity of 2.5 mgd with current use at 1.9 mgd. While currently no plans exist for expansion, the plant capacity could be doubled by installing parallel treatment units. Treated effluent from the plant and from the Pismo Beach plant are disposed of via an ocean outfall line. Sewage treatment facilities in the Bay Cities are adequate for current and future needs. Plant capacities are adequate to meet projected growth to the year 2000 (SLO, 1981b).

The entire South County area relies on subsurface sewage disposal systems (septic tanks and leech lines). A building moratorium is in effect for portions of Nipomo because of problems with degrading water quality. Local voters rejected a proposal to build a community sewer system and treatment plant (SLO, 1981c).

Santa Barbara County - The North Coast is entirely dependent on septic tanks for wastewater disposal. The North County area has adequate sewage treatment for current populations (Table III.C.3-3). Treatment plants at Santa Barbara, Santa Maria and Lompoc are relatively new and have sufficient treatment capacity for a 10-year period. Improvements are planned or in progress for plants at Guadalupe, Buellton, Summerland and Montecito. Santa Barbara County has adequate wastewater treatment capacity to 1990 with possible exceptions of Buellton, Montecito and Summerland (Table III.C.3-3). Serious deficiencies might occur in Santa Maria by the year 2000 unless efforts are made to enlarge the existing plant. This is significant as the Santa Maria area has been the main growth area in Santa Barbara County. Capacity shortfalls may also occur by the year 2000 at Guadalupe, Summerland, and Montecito.

Transportation Systems - Transportation systems of the area include one state and one federal highway, a coastal railroad and several small to medium sized airports. State Highway 1 provides the main access to Morro Bay and to the northern San Luis Obispo County coastline. The highway is four lanes wide from San Luis Obispo City to Morro Bay and then narrows to two lanes along the coast. Traffic is heaviest during the summer tourist months. The major coastal north-south highway is U.S. Highway 101. This highway runs along the coast between Goleta and Gaviota in Santa Barbara County and again in the Pismo-Avila Beach area of San Luis Obispo County. In other areas of the sale area it is located eastward of the coastal mountain ranges. Highway 101 is a 4 to 6 lane freeway along most of its length with traffic heaviest during the summer tourist months.

Coastal access is most limited or restricted at Port San Luis and in the North Coast area of Santa Barbara County. Avila Road from San Luis Bay Drive to the Avila Beach townsite is the only road in the San Luis Bay Planning Area that is experiencing a definite capacity problem. Recent traffic volume counts are as high as 1,451 vehicles for peak hours. In addition, bicycle traffic presents an additional traffic hazard. Traffic condition improvement could

TABLE III.C.3-3

WASTEWATER SURPLUSES OR DEFICITS, SANTA BARBARA COUNTY, 1980-2000 (Million Gallons Per Day)

Treatment Plant	1980	1990	2000
South Coast			
Carpinteria	.70	.60	.60
Summerland	.02	(.008)	(.015)
Montecito	.15 (.07)[a]	.61 (.23)[a]	.45
Santa Barbara	1.37	1.25	1.11
Goleta	1.70	1.50	1.40
North County			
Solvang	.40 (to .69 in 1982)	.08	.06
Buellton	.06 (.06)[a]	.24 (.06)[a]	.24
Lompoc	1.60	.92	.89
Santa Maria	1.80	0	(2.09)
Laguna (Orcutt)	1.10	.30	(.40)
Guadalupe	.04	0	n.a.

a. Assumes no improvements to existing facilities.

Source: Blayney-Dyett 1981

be achieved by construction of a separate bicycle path and installing left turn lanes at major intersections (SLO, 1981b).

Only four areas of the 64 mile North Coast of Santa Barbara County have public access. These are Point Sal State Park, Rancho Guadalupe County Park, Ocean Beach County Park and Jalama Beach County Park. Roads to Point Sal and Jalama are narrow and winding. Access to Ocean Beach located on Vandenberg AFB is limited because of conflicts with missile launchings. Additional opportunities for increased access are limited by terrain and land ownership patterns (private and federal).

Railroad service for freight and limited passenger service is provided by the Southern Pacific rail line. The railroad hugs the coastline in Santa Barbara County but runs inland parallel to Highway 101 in San Luis Obispo County north of the Bay cities.

The major airports in the area are located in the City of Santa Barbara, Santa Maria, and the City of San Luis Obispo. These airports provide a variety of services up to regularly scheduled passenger flights. There is a small airport at Oceano that serves mostly recreational activities. Vandenberg Air Force Base occupies a large part of the northern Santa Barbara County coastline. Missile launchings and space shuttle flights are, and will be, regular occurrences from the Base. Other small recreational oriented airports are located outside the coastal zones.

Electical Power Supply - There is one fossil fuel plant located in the coastal zone of the Santa Maria Basin at Morro Bay. The Diablo Canyon Nuclear Power Plant in San Luis Obispo County has not been fully certified and is not generating electricity. A liquified natural gas (LNG) facility is proposed to be located in the Point Conception area. Development of this plant has been postponed to the late 1980s.

4. Coastal Land Use: The discussion of coastal land use is restricted to that area defined as the coastal zone in California's approved Coastal Management Program (CMP) and in the California Coastal Act. The coastal zone may be up to 5 miles wide in rural areas or as narrow as 1,000 feet in urban areas. The discussion may deal with other areas where necessary. Land use within the coastal zone is directed and controlled by California Coastal Commission (CCC) approved Local Coastal Programs (LCP) or Port Master Plans prepared by or for coastal cities and counties and harbors.

Land Use - Generally the land use pattern in the coastal zone of Central California can be characterized as rural with large areas committed to cattle ranches, military bases, protected open spaces and small (5-10 acre) estates. Recreation, and tourism are dominant uses along the coast. Many land areas are protected to various degrees by Federal, State or local government ownership. The land use pattern in the coastal zone of the proposed sale area is a patch work of urban and rural areas. Urban uses alternate with open space uses of ranching, agricultural and military use.

San Luis Obispo County - The City of Morro Bay is the most northerly urban center in the proposed sale area. Located on Morro Bay, the city is a popular destination of tourists and others interested in the ecology of the Morro Bay area. Morro Rock, the dominant landmark, is the most western in a string of volcanic plugs that extend inland toward the City of San Luis Obispo. A marine terminal is located at Estero Bay, with the attendent tanks and other facilities. Pacific Gas and Electric runs a power generating plant at Morro Rock. Commercial fishermen use the harbor at Morro Bay and make a major contribution to the local economy. Morro Bay State Park is a large popular State Park located on and adjacent to Morro Bay.

South Bay is a rapidly growing residential area located on the south side of Morro Bay. A large number of residents are retirees. Montana de Oro State Park is located to the west of South Bay and also adjacent to Morro Bay.

South down the coast from Morro Bay to San Luis Bay, land uses are rural ranching and agricultural with the notable exception of Pacific Gas and Electric's Diablo Canyon Nuclear Power Plant. Currently the plant has not received operating authority and is not producing electricity.

Port San Luis and the San Luis Bay Cities of Avila Beach, Pismo Beach, Shell Beach, Grover City, Oceano and Arroyo Grande are located along a heavily urbanized portion of the coast. Port San Luis serves recreation, fishing and industrial needs. Union Oil Company owns and operates a tank farm and marine terminal in the Port. Commerical fisherman utilize the port, as do a large number of recreational boaters. Possible use of the Port as a crew base facility is addressed in the Board of Supervisors adopted LCP. Such a use can be permitted only if consideration is given to the other uses of commercial fishing, recreation, and tourism. Further studies on the Port and its potential use are being conducted by the County. Avila Beach is a small beach community located adjacent to the tank farm at Port San Luis and is predominantly a summer tourist town with heavy recreational use. Further south on San Luis Bay are the other beach cities of Shell Beach, Pismo Beach, Grover City, Oceano and Arroyo Grande. Shell Beach and the tourist oriented portion of Pismo Beach are sandwiched between the coast and Highway 101. The other three cities are located just inland from Pismo State Beach. South of the Bay Cities are the the Nipomo sand dunes. These dunes and back laying lakes dominate the coast down to Santa Barbara County and parts of the dunes are the site of a State Recreation Area. Oil and gas development is interposed in the dune and lake area. A small refinery is located behind the dunes. The Santa Maria River is the boundary between San Luis Obispo and Santa Barbara Counties.

Santa Barbara County - Rancho Guadalupe Dunes County Park is located in the sand dunes at the northern county line. The Guadalupe Dunes extend south to Mussel Point. From Mussel Point to Point Sal is an open space area of tidal pools and sand dunes. Point Sal State Park is located at the northern boundary of Vandenberg Air Force Base (VAFB). From the Park south to Jalama Beach County Park the coastal zone is under Federal jurisdiction (VAFB). Public access is available at Ocean Beach County Park. From the county park to Gaviota, the coastal zone is used primarily for ranching and agriculture with 100 acre or more minimum parcel size. A U.S. Coast Guard facility and lighthouse is located at Point Conception. Union Oil Company production and processing facilities are located at Government Point with a marine terminal at Cojo Bay. A liquified natural gas facility has been proposed to be located at Point Conception. Currently development plans have been postponed. The proposed sale area ends at Point Conception, but because of other concerns the description will continue to include the coastal zone up to the City of Santa Barbara). At Gaviota is a State Park, one of several along this part of the coast. Highway 101 makes a sharp turn inland here after paralelling the coast from Ellwood. From Gaviota to Ellwood is an area of mixed recreational, industrial and agricultural use. Three State parks or beaches are located along this stretch of the coastal zone; Gaviota, Refugio and El Capitan. Getty Oil Company operates a major consolidated facility at Gaviota, including a marine terminal. Other facilities are operated by Shell Oil Company (the Maline Field), Phillips Petroleum (Tajiguas Gas Facility), Exxon USA (Las Flores), Shell Oil Company (Capitan), Aminoil (Ellwood), Atlantic Richfield Company (Ellwood). Proposals exist for expanding the facilities at several locations to include a supply base to service the western Channel development and activities in the Santa Maria Basin. A modern marine terminal is also proposed for the western channel area. All these facilities are coastal zone dependent (CDI) indicating a dependence on being located near the ocean or dependent on the ocean. Interposed between the energy related facilities and the recreation facilities are agricultural or ranching uses. From Ellwood east the coastal zone is urbanized with some areas of open space. The University of California at Santa Barbara is located at Goleta Point and occupies a large land parcel on the coast. Additional University property is located at Coal Oil Point. Three Aminoil and Atlantic Richfield lease 40 acres for a tank farm, processing facility and marine terminal. The Santa Barbara Municipal Airport is located just north and east of the University campus. More Mesa is a 300 plus acres of undeveloped land on the coast. Urban density ranges from one dwelling per three acres to 30 dwellings per acre for the coastal zone of the Santa Barbara area. The Santa Barbara Harbor is used extensively by recreationists and has a long waiting list for slip space. Commercial fisherman also use the harbor and harbor facilities.

Land use along the Santa Barbara County coastal zone can be characterized as urbanized in the east and rural and open space uses in the north. Federal, State and local governments control large portions of the coast. Access is extremely limited in the north coast area and varies from restricted to unlimited in the south and east. Coastal dependent industry zoning is limited to existing facilities with little room for major expansion, with the exception of Exxon's 1500 acre Las Flores Canyon site.

Housing - Generally, housing availability in the coastal zone of Central California is limited in the low to moderate price range. Housing availability will continue to be limited because of the current economic situation and the decrease in the amount of Federal funds available to subsidize low to moderate housing construction. Limited availability of housing tends to drive up the cost of existing homes and those houses on the saling market.

Santa Barbara County and San Luis Obispo County (SLO) have both recognized the need to plan for potential OCS oil development and possible onshore related impacts. The Petroleum Transportation Committee, a joint industry and government study group headed by Santa Barbara County with SLO as a member, is studying and preparing recommendations for development needs in the Santa Barbara Channel and in the frontier areas of northern Santa Barbara and San Luis Obispo Counties. Santa Barbara County restricts future industrial development within the coastal zone to areas zoned Coastal Dependent Industries (CDI). These area are few in number and small in acreage (Schizos 1982, Santa Barbara County 1979). San Luis Obispo, recognizing potential needs of the oil industry, has developed policies allowing expansion of existing oil and gas facilities on Nipomo Mesa or concentrating new development in that area (de Carli, 1982; San Luis Obispo, 1981c).

The potential for any energy related development north of Port San Luis is restricted by County policy which recognizes significant deterrents to north County development from the environment and from the lack of adequate infrastructure (de Carli, 1982). Supply boats for the Channel and the Santa Maria Basin currently utilize Port Hueneme as their harbor. Crew boats utilize the facilities at Ellwood, Gaviota, Port Hueneme, and once, Port San Luis. Planning for Port San Luis has considered use of the Port as a crew boat base, but any development must also improve the recreational and existing commercial facilities and minimize conflicts with other uses (de Carli, 1982). Existing energy related facilities are listed in Table III.C.4-1.

Growth in the coastal zone and in coastal areas has been predicted to increase in a manner similar to the last 10 years. The current economic climate may curtail that growth because of limited availability of housing, and limits in some areas on the availability of water, sewage treatment and other public services. Growth can also be controlled and/or directed by land use policies developed in county and city general plans, and local coastal programs required by the Coastal Zone Management Act of 1972.

The above discussions of county plans and zoning reflects current policies. All policies, plans, and zoning are subject to change and amendment. Early coordination with local government is necessary for any proposal if modification to existing land use zoning is needed to accommodate the proposed use.

5. Commercial Fisheries: California is an important center for commercial fishing interests. In 1982, over 315,000 metric tons (695 million pounds) of fish and shellfish worth $241 million to commercial fishermen were landed in California (U. S. Dept. of Commerce, 1983). This represents about 10 percent of all landings in the United States. When the contributions of the support, processing, transportation, and marketing industries are considered, with a multiplier of 3.1 (U.S. Water Resources Council, 1977), the total value of California's commercial fishing industry is nearly $750 million.

PROPOSED SALE AREA

Two commercial fishing ports are located within the proposed sale area: Morro Bay and Port San Luis (Avila). The total value of landings at these ports is about $5 million (Table III.C.5-1). When the contributions of related jobs are considered, the total value of the commercial fishing industry in the proposed sale area is over $15 million. Although this value is small compared to the total State landings, the commercial fishing industry is a mainstay of the local economies of communities in the proposed sale area.

The total annual landings of fish and invertebrates into most fishing ports varies considerably from year to year depending in part on fish availability, market demand, weather conditions, and harvest regulations. Species composition of the catch also varies from year to year. In 1981, the most recent year for which comprehensive data are available, the most important species based on value that were landed into Morro Bay and Port San Luis (Avila) were

TABLE III.C.4-1

EXISTING ENERGY RELATED FACILITIES

FACILITY	COMPANY	LOCATION (County)[1]
Marine Terminal and Tank Farm	Chevron USA	Estero Bay (SLO)
Marine Terminal and Tank Farm	Union Oil Company	Port San Luis (SLO)
Oil Production Facilities	Thrifty Oil	Guadalupe (SB)
Oil Production Facilities	Union Oil	Government Point (SB)
Marine Terminal	Union Oil	Cojo Bay (SB)
Marine Terminal, Tank Farm Oil and Gas Processing	Getty, Atlantic Richfield, Texaco	Gaviota (SB)
Gas Processing	Shell Oil	Canadade Huerta (SB)
Gas Processing	Phillips Petroleum	Tajiguas Creek (SB)
Marine Terminal, Gas Processing	Exxon, Pacific Offshore Pipeline Company	Las Flores Canyon (SB)
Oil Production and Processing	Shell Oil	Capitan (SB)
Oil Production, Oil and Gas Processing	Aminoil USA, Atlantic Richfield	Ellwood (SB)
Marine Terminal, Oil Processing	Atlantic Richfield, Aminoil	Coal Oil Point (SB)

[1]SLO - San Luis Obispo County, SB - Santa Barbara County

SOURCES: San Luis Obispo Local Coastal Plan, Land Use Plan, Estero, San Luis Bay, South County Planning Areas 1981; Santa Barbara County Coastal Plan, 1979.

TABLE III.C.5-1

LANDINGS OF THE MORE IMPORTANT COMMERCIAL FISHES AND INVERTEBRATE
AT FISHING PORTS WITHIN THE PROPOSED SALE AREA

SPECIES	Morro Bay Weight (Thousands of Pounds) 1981[1]	1982[2]	Value (Thousands of Dollars) 1981[1]	1982
Tuna, albacore	1624	211	$ 1421	*
Rockfish, unspecified	2301	2807	644	*
Shrimp, Pacific Ocean	821	477	445	*
Halibut, California	81	90	137	*
Salmon, Chinook	56	*	167	*
Prawn, spot	48	53	120	*
Crab, rock	27	*	21	*
Sole, petrale	97	87	47	*
Lingcod	150	190	31	*
Sole, English	78	53	23	*
Sole, rex	127	127	43	*
Sole, Dover	121	211	24	*
All Other Species	266	606	111	*
Total	5797	4912+	$ 3234	*

* Unavailable

[1] Source: California Dept. of Fish and Game, Long Beach Office (preliminary data).

[2] Source: California Dept. of Fish and Game, Morro Bays Office (preliminary data).

NOTE: The 1982 data is more preliminary than the 1981 data. It is likely that the catch in 1982 for many species is greater than noted.

TABLE III.C.5-1 (Con't)

LANDINGS OF THE MORE IMPORTANT COMMERCIAL FISHES AND INVERTEBRATE
AT FISHING PORTS WITHIN THE PROPOSED SALE AREA

SPECIES	Port San Luis (Avila)				Total Landings in Proposed Sale Area			
	Weight (Thousands of Pounds)		Value (Thousands of Dollars)		Weight (Thousands of Pounds)		Value (Thousands of Dollars)	
	1981[1]	1982[2]	1981[1]	1982	1981[1]	1982[2]	1981[1]	1982
Tuna, albacore	521	59	$ 454	*	2145	270	$ 1875	*
Rockfish, unspecified	1636	1718	406	*	3937	4525	1050	*
Shrimp, Pacific Ocean	214	14	111	*	1035	491	556	*
Halibut, California	122	82	206	*	203	172	343	*
Salmon, Chinook	57	*	170	*	113	*	337	*
Prawn, spot	44	19	110	*	92	72	230	*
Crab, rock	57	*	102	*	184	*	123	*
Sole, petrale	36	191	71	*	233	278	118	*
Lingcod	97	108	47	*	347	298	78	*
Sole, English	23	104	38	*	201	157	61	*
Sole, rex	16	26	5	*	143	153	48	*
Sole, Dover	13	17	3	*	134	228	27	*
All Other Species	218	177	80	*	484	783	191	*
Total	3454	2515+	$ 1803	*	9251	7427	$ 5037	*

* Unavailable

[1] Source: California Dept. of Fish and Game, Long Beach Office (preliminary data).

[2] Source: California Dept. of Fish and Game, Morro Bays Office (preliminary data).

NOTE: The 1982 data is more preliminary than the 1981 data. It is likely that the catch in 1982 for many species is greater than noted.

albacore tuna, rockfish, Pacific Ocean shrimp, California halibut, Chinook salmon, spot prawn, rock crab, sole and lingcod (see Table III.C.5-1). Many fishermen do not fish for just one species, but switch fisheries one or more times during the year depending on market demand, harvest regulations and fish availability.

In 1977, the Fishery Conservation and Management Act of 1976 was implemented giving the United States jurisdictional control and management responsibility for all fisheries except migratory tuna within 370 km (200 nautical miles) of the coast. The Pacific Fishery Management Council, in cooperation with the U.S. Department of Commerce and State Fish and Game agencies, regulates the amount of harvest, harvest seasons and type of gear to be used by foreign and domestic fishermen in waters off California, Oregon, and Washington.

The following sections briefly describe the major fisheries in the proposed sale area, emphasizing those fisheries that are most vulnerable to impacts from oil and gas activities such as the trawl fisheries (rockfish, flatfish, shrimp, prawns). More detailed information on fisheries in the proposed sale area is given by Winzler and Kelly (1977) and Bureau of Land Management (1980).

Albacore Tuna. The albacore tuna is a pelagic schooling fish inhabiting the Pacific Coast of North America as far north as Vancouver Island during the summer and fall. As albacore move toward the eastern Pacific, they enter the American commercial fishery. Albacore fishermen often fish for salmon until albacore reach the coast.

Albacore are generally taken by trolling 8 to 10 lines at the surface from May through November. Major fishing grounds are located over 50 nautical miles from the coast, outside the proposed sale area (see the Commercial Fisheries Visual).

Albacore are frozen at sea and remain frozen until processed at canneries located in Oregon or Southern California. Fish are trucked to these areas from local buying stations.

Rockfish. Rockfish are of major importance to commercial and sport fishermen. Eight species predominate in the commercial catch. Two or three rockfishes of different species often live in close association, and they are caught together.

Rockfish are caught primarily by bottom trawl and roller gear. The trawl gear consists of a cone or funnel-shaped net which is towed or drawn through the water behind a vessel. Rollers are used to move the net over rough or steep ground without excessive power and with a minimum threat of damage to the trawl itself from bottom obstacles. Rockfish are caught throughout the year, but peak landings usually occur between May and October. Major trawl grounds are located between 128 and 366 meters (420-1200 ft., 70-200 fm) offshore Pt. Sal (see Figures III.C.5-1 and III.C.5-2). In the future, trawling is expected to expand to new areas and greater water depths. Rockfish also are caught by hook and line. Major fishing areas occur primarily between Pt. Sal and Pt. Conception inside 146 meters (480 ft., 80 fm). Some gill netting for rockfish is conducted on Santa Lucia Bank.

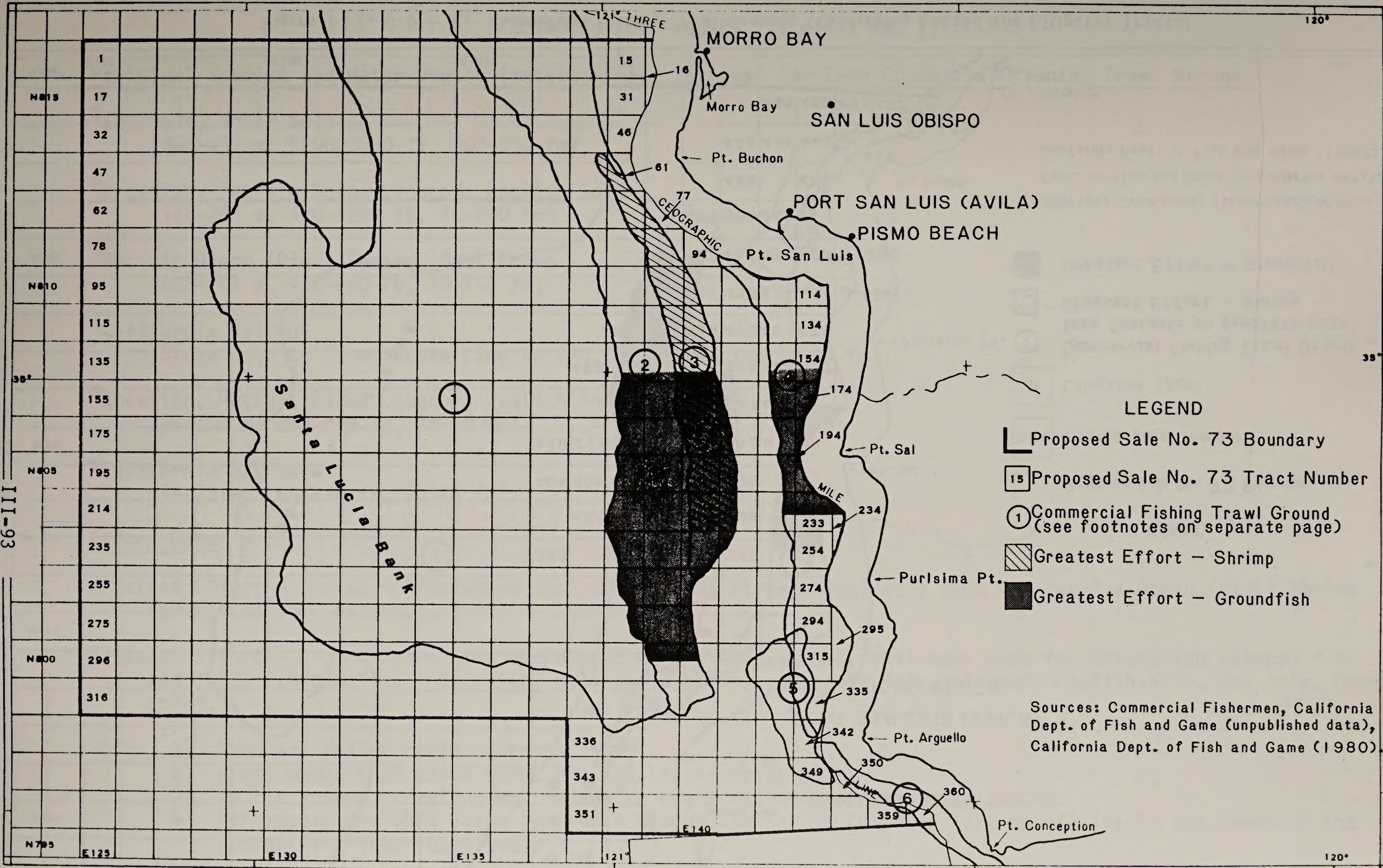

Figure III.C.5 – 1. Commercial Fishing Trawl Grounds (Overlaying Proposed Sale No. 73 Tracts)

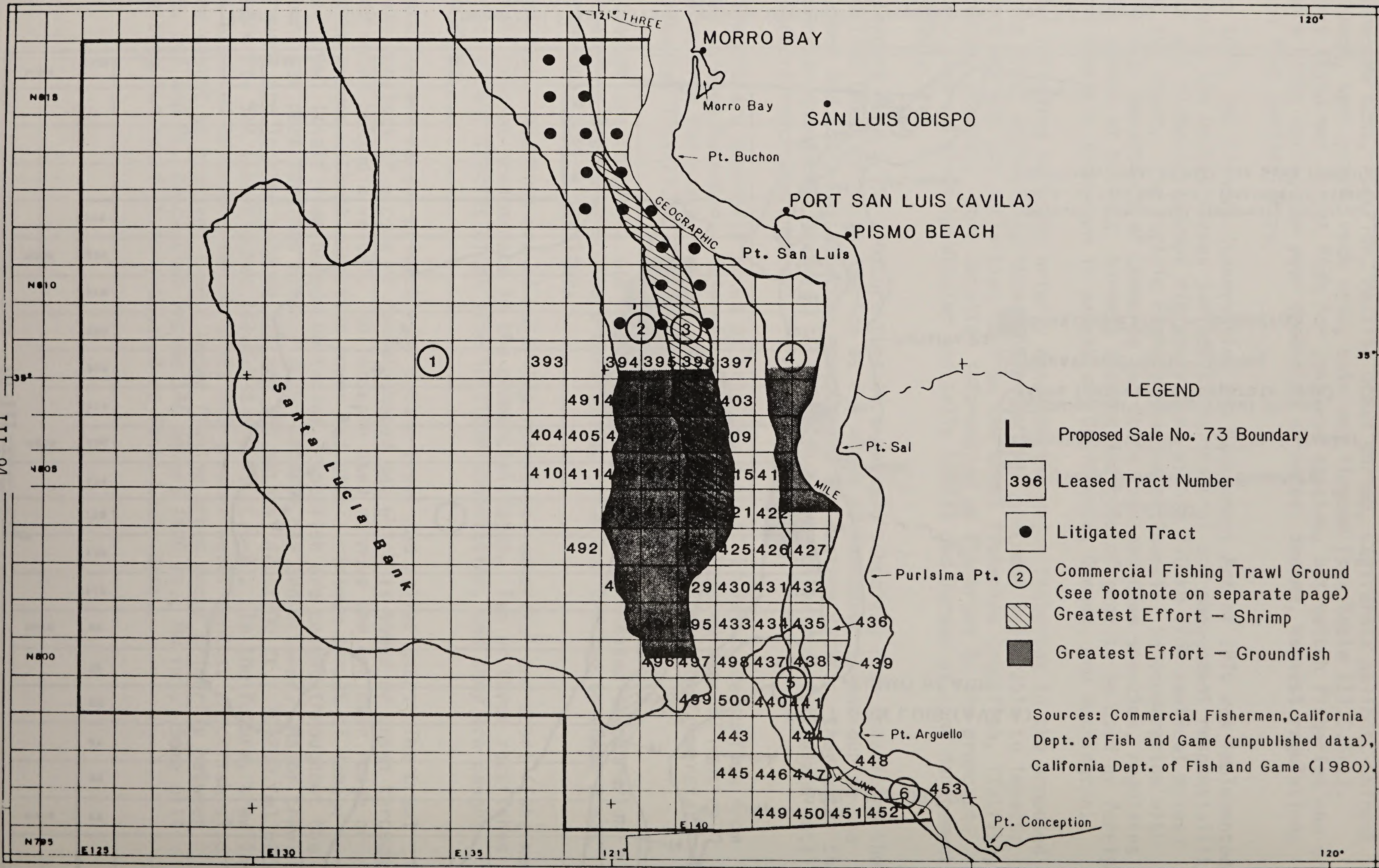

Figure III. C.5 – 2. Commercial Fishing Trawl Grounds (Overlaying Leased and Litigated Tracts)

FOOTNOTES FOR FIGURES III.C.5-1 AND III.C.5-2

Principal Species and Water Depths (meters, feet, fathoms) for Each Commercial Fishing Trawl Ground

[1]Rex Sole, Dover Sole
(366-457 m, 1200-1500 ft, 200-250 fm)

[2]Rockfish, Petrale Sole, Lingcod, English Sole
(128-366 m, 420-1200 ft, 70-200 fm)

[3]Pacific Ocean (Pink) Shrimp, Spot Prawn
(128-201 m, 420-660 ft, 70-110 fm)

[4]California Halibut
(State Line to 73 m, State Line to 240 ft, State Line to 40 fm)

[5]Rockfish, Petrale Sole, Lingcod, English Sole
(64-110 m, 210-360 ft, 35-60 fm)

[6]California Halibut
(46-73 m, 150-240 ft, 25-40 fm)

Effort Data

Greatest Effort - Shrimp = Area where most of the tows (trawl runs) were made for Pacific Ocean (Pink) Shrimp during the 1981 season.

Greatest Effort - Groundfish = Area where most of the tows (trawl runs) were made for Groundfish between 8-81 and 1-82. (Groundfish = Rockfish, California Halibut, Petrale Sole, Lingcod, English Sole, Rex Sole, Dover Sole).

NOTE:
1) Trawlers follow depth contours.
2) Areas other than those shown are trawled on occasion.
3) In the future, trawling may expand to new areas and greater water depths.
4) Bathymetry and CDFG Catch by Origin Blocks Overlaying Proposed Sale No. 73 Tracts are shown on the Commercial Fisheries Visual.

FOOTNOTES FOR FIGURES III.C.5-1 AND III.C.5-2 (con't)

OTHER FISHERIES

1) Trolling for albacore tuna is conducted outside the sale area.
2) Trolling for Chinook salmon is conducted nearshore throughout the proposed sale area.
3) Rock crabs are trapped primarily inside 55 m (180 ft, 30 fm) between Point San Luis and Point Sal.
4) Hook and line fishing for rockfish and lingcod is conducted primarily between Point Sal and Point Conception inside 146 m (480 ft, 80 fm). Gill netting for rockfish is conducted on Santa Lucia Bank.
5) Trammel net fishing for halibut is conducted primarily from 6 m (18 ft, 3 fm) to 46 m (150 ft, 25 fm) between Point San Luis and Point Sal.

Rockfish often make up a large part of the general category of market fish. Trawl fish are landed whole, filleted, and sold fresh in local markets. Hook-and-line fish may be dressed rather than filleted for certain distinct markets.

Flatfish. The principal flatfish species caught in the proposed sale area are California halibut, petrale sole, English sole, rex sole and Dover sole. Collectively, these fish are one of the most important groups of fresh and frozen market fish in California. Flatfish are caught with trawl gear throughout the year. In the proposed sale area, peak landings usually occur in one or more of the following months:

California halibut	November - March
Petrale sole	July - October
English sole	June - October
Rex sole	Variable (winter mostly)
Dover sole	Variable (winter mostly)

In most waters offshore California, trawling is prohibited within 5.6 km (3 nautical miles) of shore. However, a "California halibut trawl grounds" was established between Pt. Arguello and Pt. Mugu. In this area, trawling is allowed between mid-June and mid-March in waters more than 1 nautical mile from shore and more than 46 meters (150 ft., 25 fm) deep. Thus, north of Pt. Arguello, trawling for California halibut occurs from the State 3-mile line to 73 meters (240 ft., 40 fm). South of Pt. Arguello, trawling occurs from 46-73 meters (150-240 ft., 25-40 fm). The greatest number of tows between 8-81 and 1-82 were apparently made near Pt. Sal (see Figures III.C.5-1 and III.C.5-2). However, areas south of Pt. Sal also are important. Although trawling for halibut is important in the proposed sale area, most halibut is taken with trammel nets between Pt. San Luis and Pt. Sal in 6-46 meters (18-150 ft., 3-25 fm) water depth.

Major trawl grounds for petrale and English sole are located between 128-366 meters (420-1200 ft., 70-200 fm) offshore Pt. Sal. Some effort by boats with deepwater capabilities is used to trawl for rex and Dover sole in 366-457 meters (1200-1500 ft., 200-250 fm)(see Figures III.C.5-1 and III.C.5-2). In the future, trawling is expected to expand to new areas and greater water depths.

Flatfish are landed whole, held in ice, cut into fillets, quick-frozen and sold to local California markets. About 60 percent of the fish is waste. Much of this waste is thrown away or used for pet or mink food.

Pacific Ocean Shrimp. Pacific ocean shrimp, *Pandalus jordani*, are found from Unalaska in the Aleutian Islands to San Diego, California at depths from 37-457 meters (120-1500 ft., 20-250 fm). In California, the species is generally found from depths of 73-229 meters (240-750 ft., 40-125 fm) over a green mud of mixed mud and sand bottom (Dahlstrom, 1973). Spawning probably occurs throughout their range in California, and few survive beyond their fourth year.

Pacific ocean shrimp are harvested using specially designed trawls primarily from April to October (due to regulation). Major fishing grounds are located from Point Buchon south between 128-201 meters (420-660 ft., 70-110 fm)(see Figures III.C.5-1 and III.C.5-2).

Spot Prawn. Spot prawns, Pandalus platyceros, are found from Unalaska to off San Diego, California in waters 46-480 meters (150-1600 ft., 25-267 fm) deep. Spawning takes place in the same areas, from 128-201 meters (420-660 ft., 70-110 fm) water depth, where the prawns are fished.

Prawns are taken with trawls from April to October (depending on regulations). Major fishing grounds overlap fishing grounds for Pacific Ocean shrimp (see Figures III.C.5-1 and III.C.5-2).

Chinook Salmon. The principal salmon species caught in the proposed sale area is Chinook (king) salmon. In recent years, salmon have been one of the most valuable fishes per kilogram in the California commercial fishery. The salmon fishery is one of the oldest on the coast. The number of salmon fishermen entering California's fishery is controlled, and they compete for salmon stocks that are still under great pressure from freshwater developments and habitat degradation.

Salmon are taken commercially with troll gear from about mid-June to early August depending on when fishing for salmon is allowed. The best ocean salmon fishing in California is a few kilometers offshore.

Rock Crab. There are three species of Cancer crabs collectively referred to as rock crabs. These are the yellow crab, C. anthonyi, the rock crab, C. antennarius, and the red crab, C. productus. All three are inshore species and are found on a wide variety of substrates, particularly in rocky areas.

Crabs are taken commercially by circular steel traps that are marked at the surface with buoys. Major fishing grounds are located between Pt. San Luis and Pt. Sal, primarily inside 55 meters (180 ft., 30 fm).

Lingcod. Lingcod ranges from Baja California to northeastern Alaska. It is sought by both sport and commercial fishermen.

Most lingcod are taken incidentally in the trawl fishery or by hook and line (see Figures III.C.5-1 and III.C.5-2). Peak landings by trawl occur between May and October (December in 1982).

Lingcod are landed whole, filleted, and sold in local fresh fish markets and restaurants.

Other Fisheries. Many small fisheries also occur in the proposed sale area. Two of concern, due to their vulnerability if contacted by oil, are the oyster fishery in Morro Bay and the mariculture operations at Cayucos (just north of Morro Bay). The oyster fishery depends on the culture of an imported species, the Pacific or Japanese oyster, Crassostrea gigas. Landing data for 1981 is not available. The mariculture operations at Cayucos grow seed for all species of California abalone, clams and scallops. Mariculture research and development also is being conducted in both areas.

AREAS OUTSIDE THE PROPOSED SALE AREA

Commercial fisheries outside the proposed sale area may be vulnerable to impacts from oil spills, manmade structures such as crew and supply bases, and vessel traffic. Landings at major commercial fishing ports outside the proposed sale area are listed in Tables III.C.5-2 and III.C.5-3. General locations of fishing areas north of the proposed sale area are shown on the Commercial Fisheries Visual. Monterey Bay is one of the most important fishing areas in California. General locations of fishing areas south of the proposed sale area are shown in Minerals Management Service (1983). The Santa Barbara Channel and San Pedro Bay area are very important fishing areas. Specific fishing areas throughout California are mapped by the California Department of Fish and Game (1980). Descriptions of these fisheries are presented above, in Winzler and Kelly (1977) or in Minerals Management Service (1983). Of concern due to their vulnerability if contacted by oil are mariculture operations at Drakes Estero, Elkhorn Slough and Monterey Bay. Pacific oysters and scallops are grown in Drakes Estero. Pacific and European oysters, oyster seed, and littleneck clam seed are grown in Elkhorn Slough. Red and pink abalone seed are grown in Monterey Bay.

6. Sportfishing: Sportfishing is an important recreational activity throughout Central California. Many tourists are attracted to the area by the rich supply of marine resources. Six fishing methods predominate in the Central California ocean sportfishery: shore, pier, skiff, partyboat (commercial passenger fishing vessel), skin diving (including SCUBA), and surf netting.

Commercial passenger fishing vessels (party boats) operate year round out of the Ports of Morro Bay and San Luis (Avila). In 1980, a total of 18 boats reported landings to the California Department of Fish and Game (CDFG), originating from the proposed lease sale area. These included 12 boats documented out of Morro Bay, 3 out of Port San Luis and a few additional boats which may follow the albacore up the coast for the season (probably from San Diego). The following information concerning landings was provided by Paul Gregory of the CDFG (1983, personal communication).

Statewide landings of 6,407,949 individual fishes, were reported to the CDFG in 1980 reflecting activities of 303 partyboats and 761,958 anglers. Partyboats operating out of the proposed lease sale area (Port San Luis and Morro Bay) reported landings of 472,447 fishes for 44,794 anglers (roughly 6% of the statewide partyboat angler activity and 7% of the landings). Rockfishes (Sebastes spp.) were by far the dominant catch (422,569 fishes), followed by lingcod (19,780) and Pacific mackerel (19,277). Occasional landings of albacore, king salmon, white seabass, bonito, and barracuda also occur in the summer and fall months. For example, landings of 4,393 albacore were reported to the CDF&G in 1980.

Several sportfishermen use small skiffs to catch similar fishes as those targeted by the partyboat fishermen. California halibut is a very popular catch off Seaside and Morro Bay. Albacore are generally too far offshore for the skiff fishermen. Inside the Bay, several species of flatfish, surfperch, and jacksmelt are common. Skiff launching sites for private skiffs are located in both Port San Luis and Morro Bay. Skiff fishermen from Port San Luis are often rewarded with good runs of barracuda and bonito during fall and summer.

TABLE III.C.5-2

LANDINGS (1981) AT MAJOR COMMERCIAL FISHING PORTS
NORTH OF THE PROPOSED SALE AREA

PORT	Total Weight of Landings (Thousands of Pounds)	Total Value of Landings (Thousands of Dollars)	Principal Species (Greater than $ 100,000)
Drakes Bay (Pt. Reyes)	220	189	Chinook salmon
Sausalito	3918	1479	Pacific herring, Chinook salmon, Rockfish
San Francisco	20159	6943	Pacific herring, Albacore tuna, Rockfish, Chinook salmon, Dover sole, English sole, California halibut, Sablefish, Petrale sole, Dungeness crab, Lingcod, Sanddab, Sand sole
Oakland	4773	4028	Albacore tuna, Chinook salmon, Pacific herring
Princeton	1315	1516	Chinook salmon, Dungeness crab, Red abalone
Santa Cruz	360	534	Chinook salmon
Moss Landing	21577	5077	Albacore tuna, Chinook salmon, Market squid, Rockfish, Northern anchovy, Dover sole
Monterey	33698	5325	Market squid, Rockfish, Chinook salmon, Mackerel, Sablefish, Albacore tuna

Source: California Dept. of Fish and Game (preliminary data).

TABLE III.C.5-3

LANDINGS (1981) AT MAJOR COMMERICAL FISHING PORTS
SOUTH OF THE PROPOSED SALE AREA

PORT	Total Weight of Landings (Thousands of Pounds)	Total Value of Landings (Thousands of Dollars)	Principal Species (Greater than $ 100,000)
Santa Barbara	15509	6308	Sea urchin, Red abalone, California halibut, Black abalone, Spot prawn, Rock crab, California spiny lobster, Swordfish, Rockfish, Ridgeback prawn, Common thresher shark, Pink abalone
Channel Islands Harbor (Ventura)	418	323	California halibut
Oxnard	7043	2042	Sea urchin, Rockfish, Swordfish, California spiny lobster, California halibut
Port Hueneme	41780	2495	Mackerel, Northern anchovy, Market squid
Redondo Beach	832	356	Rockfish
San Pedro	44259	9774	Mackerel, Swordfish, Yellowfin tuna, Market squid, Sablefish, Sea urchin, Rockfish, White Seabass, Pacific bonito, Common thresher shark, California spiny lobster, Albacore tuna, Bluefin tuna, California halibut, Rock crab, Black abalone
Wilmington	15046	1451	Mackerel
Terminal Island	314314	98929	Yellowfin tuna, Skipjack tuna, Mackerel, Pacific bonito, Northern anchovy, Albacore tuna, Bigeye tuna, Bluefin tuna, Common thresher shark, Swordfish, Unspecified shark, Market squid, Rockfish
Newport Beach	135	348	Swordfish

Source: California Dept. of Fish and Game (preliminary data).

The California Department of Fish and Game (1964) has identified five fishing piers which are immediately adjacent to the proposed lease sale area: two public piers in Morro Bay; one public and one private pier at Avila; and the public fishing pier at Pismo Beach. Jacksmelt and surfperches dominate the catch at the Morro bay and Pismo Beach piers. At Avila pier, white croaker is the year-round dominant although smelt and surfperches are also very abundant. Pier fishing is best at all piers discussed during the fall and summer months.

Some shorefishing also occurs in the proposed lease sale area. Barred surfperch, walleye surfperch, silver surfperch, and calico surfperch are by far the most dominant fishes caught by surfcasters off sandy beaches. The beaches from Oceano southward are particularly popular for barred surfperch. Other fishes caught from shore include jacksmelt, starry flounder, sand sole and several small sharks. Occasionally surfcasters may land striped bass or white seabass when the runs occur close to shore.

Shore fishing is very popular from rocks between Avila and Shell Beach. The best sportfishing from shore occurs during late spring and summer. Monkeyface eels are occasionally caught around Shell Beach. Other sportfishing activities in the area may occur only at night. These night activities include surf netting for smelt (early winter through summer) and the capture of grunion (Leuresthes tenuis) by hand.

Spear fishing using skin or scuba diving gear is a popular way of fishing in Central California. Diving may occur from shore or from a skiff. The most commonly speared fishes by divers include rockfish (Sebastes spp.), striped surfperch, kelp greenling, cabezon, and lingcod. Skin and scuba divers also take several invertebrates from shallow waters. Abalone (Haliotis spp.) collecting is very popular along rocky shores and breakwaters between Avila and Shell Beach.

Pismo clams were once plentiful along the beaches adjacent to Morro Bay and between Pismo Beach and Guadalupe. Pismo clams are currently much reduced in numbers and several areas in San Luis Obispo County have been closed to sportfishermen by the CDF&G. Pismo clam reserve has been established near Guadalupe closing off a small area to sportfishermen. Digging for other invertebrates such as geoducks, Washington, razor, and gaper clams still occurs, particularly inside Morro Bay.

The economic value of sportfishing can be approximated using the data presented in the report by the Granville Corporation (1981). This places the value in excess of $75 million in 1980, but does not include the value to the fishermen of the actual catch. A more detailed description and analysis of marine recreational fishing for the Pacific Coast should become available from the Pacific Marine Fisheries Commission in the near future. Preliminary results from this study are shown on Table III.C.6-1.

7. Recreation: The Central California Coast is a highly sensitive natural resource area and is an important recreational asset to the residents of the State and to tourists. A diverse landscape exists along this stretch of coastline which varies from rugged, wind blown cliffs to flat sandy beaches with stable dune backshores. This diversity creates a unique area which changes character at every bend of the shoreline and embayment, attracting

TABLE III.C.6-1

TOP TEN SPECIES CAUGHT BY NUMBERS AND WEIGHT, 1980
(EXCLUDES SALMON ANGLERS AND THEIR CATCH OF OTHER SPECIES)

Number	Weight
Surf Smelt	Lingcod
Night Smelt	Surf Smelt
Blue Rockfish	Blue Rockfish
Brown Rockfish	Black Rockfish
Northern Anchovy	Yellowtail Rockfish
White Croaker	Olive Rockfish
Yellowtail Rockfish	Canary Rockfish
Black Rockfish	Bocaccio
Redtail Surfperch	Redtail Surfperch
Lingcod	Cabezon

Source: Marine Recreational Fishery Statistics Survey, Pacific Coast, prelininary data tourists from all parts of the world to view the scenery and enjoy the solitude of vacationing in a relatively pristine environment. Along the coast, recreation is primarily water dependent and water enhanced and encompasses both active participation and esthetic and passive aspects. There are numerous public and privately owned recreational sites which have direct access to the ocean. The Federal and State owned areas in Central California are shown on Figure III.C.7-1. A complete listing of recreational sites is presented in POCS Technical Paper No. 81-5 (The Granville Corporation, 1981). Access sites have been listed and described for the California Coast by the Coastal Commission in the California Coastal Access Guide (1981). Water dependent marine recreation includes such activities as boating, fishing, surfing, swimming and diving. Each of these activities can be divided into several sub-components such as sail and power under boating, finfishing or shellfishing, etc. The point to be made, however, is that each one of these recreational activities is dependent upon an accessible and unpolluted marine environment. Most of these activities occur in close association with the established shoreline park, recreation, beach and public access sites within the Central California planning area.

Other recreational activities closely associated with the coastal and offshore environment of Central California are water enhanced. The ocean provides a setting which enhances the enjoyment of such activities as beach use, sightseeing, picnicking, camping, golfing and off-road vehicle use. Like water dependent activities, most water enhanced recreational activities potentially affected by OCS exploration and development occur along the shorefront park, recreation, beach, camping and public access sites.

Although the distinction between a recreationist and a tourist relates to residence, travel and expenditures, recreational resources, be they developed or natural, are the common medium for both industries. The nearshore Pacific Ocean is in fact the premier recreational resource and attraction of the California Coast.

Although most recreational activity occurs within or near the park, recreation, beach and public access sites, the most intense use of available recreational resources is generally found in close association with the major coastal population centers (San Francisco, Santa Cruz, Monterey and Santa Barbara). Public recreation lands such as Golden Gate National Recreation which has over 28 miles of shoreline including Pacific Coast, and San Francisco Bay accounts for over 20 million visitors a year, half or more of which are to beach areas. Private areas as well, such as the 17 Mile Drive around the Monterey Peninsula, attracts millions of people annually, primarily because of the natural and scenic qualities of the Pacific Coast shoreline. Seasonality and weather also have a major temporal influence on the intensivity and extensivity of recreational activity.

The Granville Corporation (1981) assessed the economic value of recreational expenditures by residents of Central California at almost $400 million per year. More important than economics is the social and welfare value of recreation to individual citizens. In summary, the Pacific shorefront and its associated designated, natural and developed recreational resources provides an irreplaceable resource and setting of incomparable value to the residents of the Central California Coast.

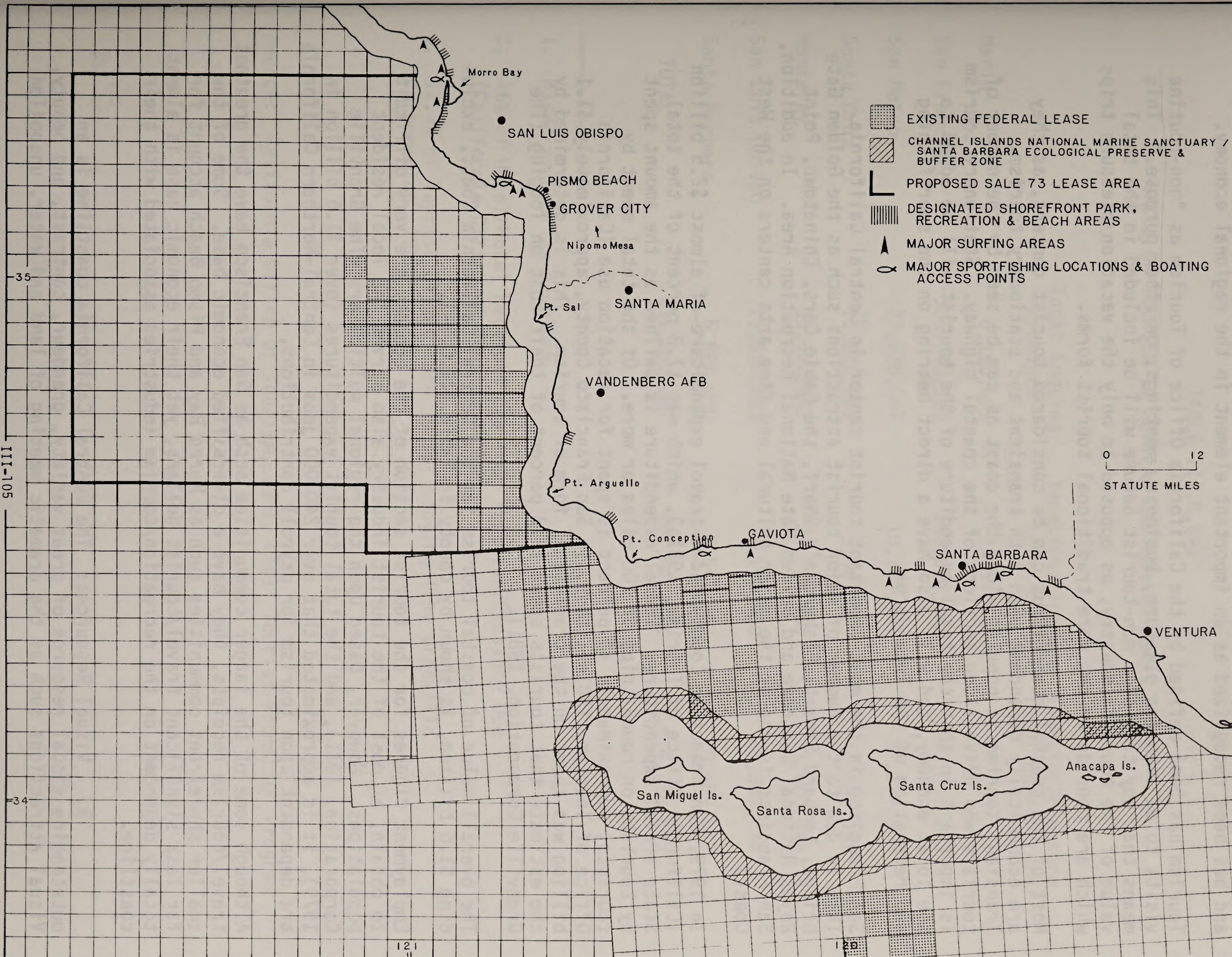

Figure III.C.7-1 Major Recreation and Tourism Areas Most Directly Associated with Proposed Sale 73.

8. Tourism: Tourism is one of the major industries in California, and has been recognized as an important element in the regional economy.

Tourism has been defined by the California Office of Tourism as "non-routine visits to an area for pleasure, business, meetings, or other purpose." This means that any trip of a non-tourist nature will be included in the total value of the tourist industry, as opposed to only the vacation/pleasure trips which are considered the more traditional tourist forms.

Most of the coastal communities can be considered tourist centers, as they are economically dependent upon both transient and stationary tourism. Transient tourism is popular along the coast as can be seen by the number of tourists who drive along sections of the coastal highway. Stationary tourism is important in that the total expenditure of the tourist will be added to the local economy, and will also have a direct bearing on the sportfishing and recreation of the local area.

San Francisco is the most important tourist center in Central California. This is due to the number of major tourist attractions such as the Golden Gate Bridge, Lombard Street, Fisherman's Wharf, the Cable Cars, Chinatown, Point Reyes National Seashore and Golden Gate National Recreation Area. In addition, San Francisco is one of the major cultural and fine arts centers on the West Coast.

In 1979, San Francisco County had a travel expenditure of almost $2.5 billion (California Office of Tourism, 1981a), which was 17.8 percent of the total State travel expenditure. Travel expenditure is defined as the amount spent by tourists on round trips of 200 miles or more. Of the total spent by tourists, approximately 46 percent is spent for vacation use (California Office of Tourism, 1981a); thus, in San Francisco County, approximately $1.1 billion was spent on the traditional form of tourism. This is determined by the estimate that tourists spend 12.3 percent of their cost on lodging (The Granville Corporation, 1981).

The overall value of coastal tourism for the Central California Coast, excluding $1.6 billion, is shown by county in Table III.C.8-1.

Employment figures for the tourist section of the economy are very difficult to obtain, as most of the tourist industry also serves the local resident populations. However, based upon the regional multipliers (The Granville Corporation, 1981), and the total tourist expenditures (over $1.6 billion in 1979), it is approximated that over 240,000 jobs in Central-Northern California are dependent upon tourism for payroll contributions.

Although some of the larger communities such as San Francisco have the greatest travel/tourism receipts, they have a diversified economic base. Some of the smaller shorefront communities such as Morro Bay and Pismo Beach account for far less significant travel/tourist dollars, yet their economic base is almost totally dependent on the recreation/tourism industries associated with their coastline.

9. Visual Resources: The Central California coastline is an outstanding visual resource of great variety, grandeur, contrast, and beauty. Visual attractions such as the dramatic meeting of land and water, unspoiled

TABLE III.C.8-1

VALUE OF TOURISM IN CENTRAL CALIFORNIA COAST (1979)

	Total Lodging Receipts[1]	Vacation/Pleasure Lodging[2]	Vacation/Pleasure Total Expenditure[3]
Marin	6,193,675	2,849,090	23,163,337
San Francisco	305,843,569	140,688,042	1,143,805,218
San Mateo	23,336,567	10,734,821	87,274,965
Santa Cruz	11,872,562	5,461,379	44,401,453
Monterey	63,532,361	29,224,886	237,600,699
San Luis Obispo	15,530,283	7,143,930	58,080,734
Santa Barbara	5,524,050	2,541,063	20,659,049
TOTAL	431,833,067	198,643,211	1,614,985,455

1. Based on Bed Tax Receipts

2. 46% of Hotel/Motel Receipts are from Vacation/Pleasure Use (California Office of Tourism 1981a)

3. 12.3% of Tourist Expenditure is for Lodging (The Granville Corporation, 1981)

Source: California Office of Tourism, 1981, Local Tourism Promotion Program natural areas filled with wildlife, and the rich texture of urban shorelines add to the quality of life.

Since the conception of what is aesthetic or beautiful is wreathed in human creativity, emotion, philosophical standards, and cultural background, widely divergent views can emerge from any discussion of visual resources. Certain principles do emerge which are suitable for analytical treatment. These are primarily concerned with the visual perception, as other types of stimuli such as sound and smell are fairly easily characterized as pleasant, neutral, or unpleasant. Visual attractions such as the dramatic meeting of land and water, the framed and unframed views of the ocean, the texture of the vegetation and urban areas, and the overall harmony of the scene add to or detract from the quality of life for coastal residents and visitors, and will contribute to the economic success of the tourist industry by attracting vacationers to the shoreline.

The systematic analysis of scenic quality is a complex and difficult task because of the great variety of natural and man-made conditions along the California coast. The Bureau of Land Management has developed a rating system that attempts to objectively rate, on a regional scale, the visual quality of the various landscapes on the California coastline. This system is based on a landscape architectural viewpoint and has incorporated the texture, harmony, variety, cultural modifications, vegetation, and form of the area into the rating methodology.

The rating of the coastline, although subjective, does present the aesthetic quality of the coastline on a physiographic scale. Each landscape unit is rated on the same basis. The units are rated on their own standing, and not in relation to any other unit. This permitted a relative aesthetic quality of the California coast to be obtained; however, the use and accessibility levels for each unit are not considered. The complete results of the study are given in POCS Technical Paper No. 81-5 (The Granville Corporation, 1981); however, the values given in the study should not be taken as absolute, but should be used to show the relative trend of the aesthetic value of the coastline.

Among the more pristine and aesthetic regions of the Central California Coast based on the study are Point Reyes Headland to Stinson Beach, Golden Gate, San Gregorio to Point Ano Nuevo, Santa Cruz area, Monterey, Pacific Grove, Big Sur Coast (Point Lobos to San Luis Obispo County Line), Point Buchon, and Point Sal. This list should not be taken as being all inclusive, but should be used to show the general trend of the aesthetics of the coast.

Property values of the region are affected by aesthetics and natural landscape features of the local areas, with the more aesthetically pleasing areas tending to have a higher real estate value than the other areas.

Accessibility of the areas tend to be less, or virtually nonexistent, for the more pristine areas, and thus, these areas tended to have less use than the more developed and easily accessible areas. Some areas have high recreational use due to their being accessible, having relatively high aesthetic rating, and being close to centers of population. This is seen in the Golden Gate National Recreational Area which had an attendance of over 22 million visitors in 1982. This area is highly scenic, has over 28 miles of shoreline including

Pacific Coast and Tomales Bay, and San Francisco Bay, and is within the general driving range for a day trip from San Francisco.

In general the Central California Coast is a highly diverse region with an overall very aesthetically pleasing texture. Thus, any attempt to rate it has to be a subjective estimate of what qualities are important in reflecting the relative aesthetic qualities of the California Coast.

10. Cultural Resources: Cultural resources are prehistoric and historic remains comprising a non-renewable resource base that provides archaeologists, anthropologists and historians with information for reconstruction of past cultural systems and behaviors. Cultural resource management by individuals, institutions, and governmental agencies involves the identification of these resources, their protection, and preservation for maximum longevity (Lipe, 1977). This has led to the establishment of the National Register of Historic Places and the California Historic Landmarks. Numerous places have been placed on these lists to aid in their preservation. Additional sites are potentially eligible to be added to the list. Most of these sites will not be affected by OCS development. A listing of these sites is included in Appendix M. In addition to traditional cultural (i.e., archaeological) resource concerns, religious and other cultural elements of concerned ethnic minorities are addressed in this document.

Early Man in California. It is not certain when the California Coast was first occupied because worldwide sea level changes (eustatic variation) may have submerged the archaeological remains of those early coastal dwellers. Sea level has varied greatly during recent and Pleistocene times (Quaternary). At the present time, sea level is approximately 120 m above the sea level of 40,000 B.P. This means that much of the early coastal region possibly occupied by the earliest Californians is presently submerged.

Terrestrial Cultural Resources. The coastal lands contain numerous archaeological sites, most of which represent Native American resources. The heavier concentration of sites recorded in some counties is partially a reflection of large indigenous populations (e.g., Santa Barbara County), and mainly the result of the degree and intensity of surveying.

In 1976 there were 725 archaeological sites in San Luis Obispo County and 1,288 archaeological sites in Santa Barbara County. Most of these sites are inland and would not be impacted by OCS development (California Department of Parks and Recreations, 1976).

In recent years, there has been an increased interest in historical archaeology. California's long history is providing a wealth of archaeological material from the different ethnic and cultural groups which have settled in California. In 1977, 69 sites in San Luis Obispo County and 73 sites in Santa Barbara County had been designated as historic sites (Winzler & Kelly, 1977). As with the prehistoric sites, most of the historic sites are inland, and would not be impacted by OCS development.

A listing of the historic sites which are either on a proximal to the coast is to be found in Appendix M.

Contemporary Native Americans. There are presently about 15-20,000 Native

American residents in the central-northern coastal counties, although many are from other areas and States.

Subsistence gathering continues today both inland and on the coast. The intertidal zone is especially important to coastal dwellers. Although not well documented, family-gathered foodstuffs account for up to 25 percent of total subsistence for some Native American families. Traditional medicines, herbs, and teas are also gathered.

The only native Americans who are descended from the original inhabitants of the San Luis Obispo - Santa Barbara Counties are the members of the Chumash and Salian tribes. These tribes represent only a small portion of the native Americans in California. The majority of the native American population are originally from out of state.

Gathering for ceremonial purposes is primarily documented by BLM (Field Notes) in the Point Conception area.

Both subsistence and ceremonial gathering has been reduced in recent years because of a decrease in the supply of traditional plant and animal foods. Although the intertidal zone is controlled by the State, beach access in many areas is restricted by private property owners.

There are numerous geographic landmarks and areas that are of special concern to Native Americans because they were traditionally used by their ancestors. Many of these places are still being used in traditional ways. In addition, there has been a resurgence of interest in traditional practices and beliefs both among those who were raised in these cultural experiences and among those individuals who have adopted these ways of life.

Offshore Cultural Resources. The offshore region of California is believed to contain numerous cultural resources. Types of submerged resources are aboriginal remains, and sunken ships and aircraft. The field of marine archaeology in this region has developed only recently. Thus far, most marine prehistoric work has occurred in Southern California in the San Diego and the Santa Barbara Channel areas. This does not necessarily reflect a lack of resources along the Central Coast, only a lack of investigation in those areas.

Shipwrecks are important because they capture an instant in the life of a culture and preserve it fairly intact. Sinking was generally in the violent circumstances of war, storm, or sudden encounter with unseen reefs or rocks, none of which usually provided ample warning or opportunity to salvage. Increased numbers of shipwreck artifacts have been recovered offshore California in recent years. Materials which have been recently salvaged from old wrecks include such small and perishable items as fabrics, spools of ribbon, hats, shoes, foodstuffs, awls, and needles. Studies have identified over 1,500 vessels that were reported lost along the coast of California.

Over forty of these wrecks have occurred in the area from Point Conception to Morro Bay and they range from significant shipwrecks such as the YANKEE BLADE, to insignificant wrecks such as the WHALE.

Most of the losses have been reported in State, rather than Federal waters. Though the locations of historic shipwrecks have been in some cases precisely noted, they are often many miles from the location of their reported loss. Location errors have occurred because of navigational error, loss report error, or because of vessel drift. It is not uncommon for an abandoned damaged ship to drift for a long distance prior to eventual sinking. For these reasons, it is very likely many of the shipwrecks reported in State waters actually lie in Federal waters.

11. Ports and Harbors: Nine major ports/harbors exist in the Central California Area: San Francisco Bay Entrance, San Francisco, Redwood City, Oakland, Richmond, San Pablo Bay and Marc Island Strait, Carquinez Strait, Suisun Bay Channel and Moss Landing (refer to Visual No. 2, BLM, 1980). These ports provide access to local and regional markets as well as foreign commerce.

Numerous fishing ports exist between San Francisco Bay and Avila Bay in Central California. Port San Luis currently (Elder, 1983) has about 300 moorings: about 180 resident commerical fishing boats; about 50 resident recreational boats; and room for about 120 transient commerical fishing boats. The Port experiences intensive recreational use, particularly in the summer when about 18 boats per day are launched. Union Oil's marine terminal typically receives about thirty 40,000 Dead Weight Ton tankers. The terminal was recently damaged, however, by winter storms. Union plans on reconstructing the terminal, using a steel structure, within a year.

Vessels in Morro Bay moor at both public and private docks, wharves and piers and there are privately maintained anchorages in the channel. In the Bay, there are 640 feet of privately-owned piers, 550 feet of city-owned pier, 1,548 feet of loading docks, 263 feet of State-owned docks and 5,435 feet of privately owned docks (Centaur, 1981). There are about 185 commercial fishing vessels, 254 pleasure crafts, 12 commercial passenger-carrying fishing vessels and 55 other types of vessels for a total of over 500 vessels, not including transients. Over 150 tankers per year stop at the marine terminals north of the Bay. The ports provide berthing space and support facilities for the commercial fishing industry and recreational boating enthusiasts (refer to Sections III.C.5 and 6). Recreational boating activity is primarily confined to the area between Monterey and San Francisco to the north; and Morro Bay and Avila Bay to the south.

12. Marine Traffic: Commercial and military vessel traffic offshore Central California is routed through a system of Traffic Separation Schemes and Port Access Routes that are established by the U.S. Coast Guard. A Traffic Separation Scheme (TSS) is an internationally recognized vessel routine measure which serves to provide a separation of opposing flows of vessel traffic. A Port Access Route (PAR) generally consists of a Precautionary Area and associated TSSs. Precautionary Areas are defined as areas within defined limits where vessels must navigate with particular caution. At the time of this writing, a PAR lies off the San Francisco Bay entrance. The PAR consists of a Precautionary Area with northern, western, and southern TSS approaches (refer to Visual No. 1, BLM, 1980). The Santa Barbara Channel TSS lies immediately below the proposed sale area.

The total freight traffic between Point Conception and San Francisco including Moss Landing, Morro Bay and Port San Luis for calendar year 1977 is presented in Table III.C.12-1. A total of 3,781 vessels arrived at the San Francisco Bay in calendar year 1981. This represents an average of three tankers and

TABLE III.C.12-1

TOTAL FREIGHT TRAFFIC FROM POINT CONCEPTION TO THE SAN FRANCISCO BAY

Harbors	Total Waterborne[a] Tonnage (Short Ton = 2,000 Pounds)	Vessel[b] Arrivals
Moss Landing	2,204,350	85
San Francisco Bay Entrance	56,183,514	4,221
San Francisco	1,931,693	6,927
Redwood City	410,293	175
Oakland	6,828,938	4,992
Richmond	23,823,508	6,298
San Pablo Bay and Marc Island Strait	26,712,751	4,139
Carquinez Strait	24,740,631	3,668
Suisun Bay Channel	7,920,404	1,719
Total (Exclusing S.F. Bay entrance)	94,572,568	28,359
Port San Luis		30[c]

Source: Department of the Army Corps of Engineer, 1977. Waterborne Commerce of the United States, Part 4.

[a] Includes military shipping.

[b] Excludes domestic fishing craft, military ships, pleasure boats and through traffic.

[c] 40,000 DWT tankers, 1982.

seven other types of large vessels (i.e., cargo, passenger) per day that entered the Bay during 1981. The total number of vessels arriving in the Bay has declined about 28 percent since 1968, when there were 5,218 vessel arrivals. The number of vessel arrivals at the Los Angeles-Long Beach ports was 7,343 in calendar year 1981 (i.e., about 20 vessels per day). At the time of writing, about 24 large vessels pass through the Santa Barbara Channel each day. This marine traffic consists of about 30 percent tankers, 20 percent containerships, 25 percent breakbulk cargo ships (i.e., freighters), 13 percent dry bulk carriers, and 12 percent other type ships such as auto carriers, lumber ships, passenger ships, etc. (U.S. Department of Commerce, 1981a). About thirty 40,000 DWT tankers per year arrive at the marine terminal at Port San Luis.

The U.S. Coast Guard (Twelfth and Eleventh Districts) has recently completed studies of the potential traffic density and the need for safe access routes offshore California. These "Port Access Route Studies" were mandated by the Ports and Waterways Safety Act (PWSA) (Public Law 95-474; 92 Stat. 1473; 33 U.S.C. 1223). Based on the results of these studies, the PSWA designated the Coast Guard to propose appropriate vessel routing measures such as safety fairways and traffic separation schemes. These measures would provide safe access for vessels that proceed to and from ports or places subject to the jurisdiction of the United States.

The Twelfth and Eleventh Coast Guard Districts have recently published their Port Access Route Study results and recommendations (Twelfth District: Federal Register Vol. 47, No. 199; Eleventh District: Federal Register Vol. 47, No. 122). At the time of this writing, these recommendations have not been adopted. Possible implementation of the recommendations will involve the following: a) a notice of proposed rulemaking with subsequent public, private, and governmental input; and b) an application to the International Maritime Organization. These actions are thought to be adopted by the Coast Guard by December, 1984. The recommendations of each district follow. See Figure III.C.12-1 for a visual depiction.

Twelfth District. The San Francisco TSS would be retained with northern, western and southern approaches. These approaches would be changed, based on the results of the Port Access Route Study.

The northern and southern lanes would be reoriented and the southern lanes lengthened. A shipping safety fairway would lie over the Precautionary Area and each of the traffic lanes. The portion of the routing measure that extends southward from the San Francisco TSS's southern approach lanes would be a 120-mile long, five-mile wide shipping safety fairway. These routine measures were designed to align with those recommended by the Eleventh District. The Coast Guard is considering the use of a fairway to overlay the extension of TSS lanes proposed by the Eleventh District between a point off Point Conception and 35°N latitude.

Eleventh District. The Eleventh Coast Guard District has proposed the following recommendations for vessel traffic routing in the Santa Maria Basin area: 1) the existing TSS from Point Fermin to Point Conception is recommended to be extended in a northwesterly direction; 2) a new TSS would extend northward from a new Precautionary Area (described in 3, below) off Point Conception to latitude 35°00'N (where it would meet with the Twelfth District's routine scheme); and 3) a new Precautionary Area with a four

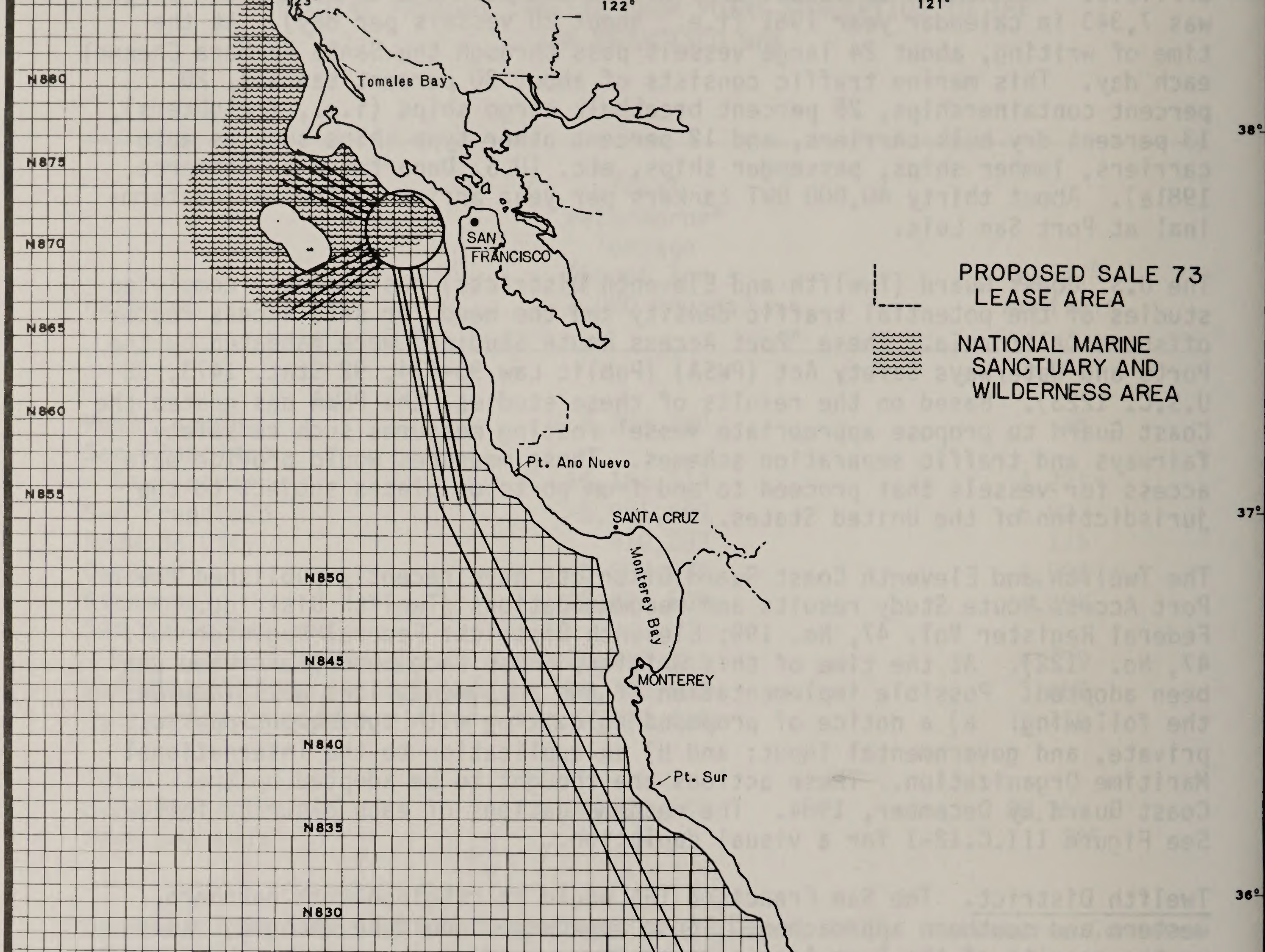

FIGURE III.C.12-1. COAST GUARD RECOMMENDED PORT ACCESS ROUTE, TRAFFIC SEPARATION SCHEME, SAFETY FAIRWAYS, AND PRECAUTIONARY AREAS OFF THE CENTRAL CALIFORNIA COAST.

nautical mile radius would connect the extension of the existing, generally east-west TSS with the new generally north-west TSS. It would also serve as a junction for transpacific traffic and for traffic merging with the Trans-Alaskan Pipeline System (TAPS) Tanker Route.

13. Refineries: The refinery capacity in California, as reported in the March 21, 1983, Oil and Gas Journal, is presented in Table III.C.13-1. A total of 40 refineries exists in California with a total refining capacity of 2,543,543 barrels per calendar day (bcd). Calendar-day numbers represent the mean volume that a refinery unit processes each day, including down time used for turnarounds. This is the actual total volume for the year divided by 365.

Refineries are confined to the San Francisco Bay area, Santa Maria area, Greater Los Angeles area, San Joaquin Valley, Oxnard, and Ventura. Approximately 56 percent of the refinery capacity is located in the Greater Los Angeles area. See also BLM, 1981, Section III.C.6.a.

14. Offshore Structures: At the time of this writing, no permanent oil or gas platforms exist in the Central California Planning Area. Exploratory operations are underway in the Santa Maria Basin on four leases. These exploratory operations are temporary in nature, usually lasting less than 4 months per well.

Seven marine terminals are located between Moss Landing in Monterey Bay and Avila Bay near San Luis Obispo (refer to Visual No. 2, BLM, 1980). Marine terminals are used to distribute hydrocarbons to and from tankers. Hydrocarbons are off-loaded at the marine terminal and pumped to shore for distribution via subsea pipelines. These pipelines range in diameter from 2 to 24 inches. Associated with the marine terminals are onshore facilities such as storage tanks and distribution systems.

15. Military Uses: Approximately 87 percent of the California OCS between Morro Bay and Point Conception currently proposed for leasing is now being used for various military operations (U.S. Department of the Interior, 1980a, Visual No. 1). The military groups involved are the Navy and the Air Force. The activities include flight training, missile firing and testing, submarine diving and transitting, and anti-submarine warfare. Much of these activities are conducted on a daily basis and are considered vital to overall national security.

The greatest potential impact to military operations results from space-use conflicts. Military exercises require large areas of exclusive-use space, both above and below the water surface, wtih large safety zones. For most of the Central California coast, military operations begin at least 6-15 miles offshore, leaving a fairly wide margin for nonmilitary activity closest to the coast, where the oil industry would be most active. The key exception to this is the nearshore area between Point Sal and Point Conception, which falls under the general umbrella of activity of nearby Vandenberg Air Force Base. The Pacific Missile Test Center (Point Mugu) operates the area just west of Vandenberg, designated as Warning Area 532. The activities in certain parts of this area (5C, 6C, 6D) are very hazardous missile operations, considered vital to overall national defense. These areas require exclusive-use designation by the Navy. Thus, the currently proposed leasing area overlaps

TABLE III.C.13-1

CALIFORNIA REFINERIES AND CAPACITIES

Companies and Locations	Crude Oil Capacity (Barrels per Calendar Day)
Los Angeles Basin	
Atlantic Richfield Co. - Carson	205,000
Champlin Petroleum Co. - Wilmington	60,000
Chevron USA - El Segundo	405,000
DeMenno-Kerdoon - Compton	14,250*
Douglas Oil Co. - Paramount	46,500
Eco Petroleum - Signal Hill	7,000
Edgington Oil - Long Beach	41,600
Fletcher Oil and Refining - Carson	29,500
Golden Eagle Refining - Carson	16,500
Gulf Oil Co. - Santa Fe Springs	51,500
Huntway Refining Co. - Wilmington	5,425
Lunday-Thagard Oil Co. - Wilmington	
Macmillan Ring-Free Oil - Signal Hill	
Marlex Oil and Refining - Long Beach	19,000
Mobil Oil Corp. - Torrance	123,500
Newhall Refining - Newhall	21,400
Pacific Oasis - Paramount	46,500
Powerine Oil Co. - Santa Fe Springs	44,120
Shell Oil Co. - Wilmington	108,000
Texaco - Wilmington	75,000
Union Oil Co. of California - Los Angeles	108,000
Oxnard-Ventura	
Oxnard Refinery - Oxnard	4,700
USA Petroleum Corp. - Ventura	27,900
San Joaquin Valley	
(10 Refineries)	222,123
Santa Maria Area	
Douglas Oil Corp. - Santa Maria	9,500
Union Oil Corp. - Arroyo Grande (Capacity included with Union Oil, Rodeo)	
San Francisco Bay Area	
Chevron USA - Richmond	365,000
Exxon Co. - Benicia	106,000
Huntway Refining Co. - Benicia	7,125
Pacific Refining Co. - Hercules	45,000
Shell Oil Co. - Martinez	91,400
Tosco Corp. - Martinez	126,000
Union Oil Co. - Rodeo	111,000
Total for California (40 Refineries)	2,543,543

*Converted from Barrels per Stream Day

Source: Oil and Gas Journal, 21 March 1983, Annual Refining Survey.

substantially with areas currently designated as military operating areas.

The military has listed specific tracts recommended for either sale deletion or stipulation. These are included in Chapter V (Consultation and Coordination).

ENVIRONMENTAL CONSEQUENCES

IV.

CHAPTER IV

IV. ENVIRONMENTAL CONSEQUENCES

A. Information Used in Impact Analysis

1. Resource Estimates: Resource estimates used for analysis of the potential environmental impacts from Alternatives I are discussed in detail in Section II.A.1.b. The estimated resources for the Central and Northern California and Southern California Planning Areas are listed in Table IV.A.1-1. Table IV.A.1-1 also presents information on the Southern California Reserves.

2. Exploration and Development Assumptions: Proposed Sale No. 73 will lead to the exploration for and the potential development and production of oil and gas resources. The oil and gas operations (pre-lease) will begin with geophysical surveys and geological sampling programs designed to study the age, structure, and hydrocarbon potential of the area.

After leasing, exploratory wells will be drilled by industry on the best petroleum prospects as suggested by the geological and geophysical data in order to locate, delineate, and characterize hydrocarbon reservoirs. These wells are drilled from semi-submersibles, jackups, and drillships. All three are assumed in this analysis. If commercially productive reservoirs are located, development wells are normally drilled from fixed platforms. These wells include production wells and a variety of service wells which increase the productivity of the field. Subsea completion systems may also be used. The exploration, development and production phases of oil operations require docking and onshore equipment storage, service facilities, helicopters, and attendant facilities.

The analysis presented in Sections IV.E and O is based on the made in this document is based on the Most Likely and Conditional Mean Resource Estimates respectively, and their associated development, hypothetical transportation scenarios.

Using these development timetables, resource estimates, and hypothetical transportation scenarios, the following further development assumptions were made by MMS (see Section II.A.1.d.): 1) No petroleum refineries are expected to be constructed in California as a result of the proposed sale. (However, modifications (i.e., retrofitting) to the refining process will be required in order to process heavy, sour crude oil); 2) Pipelines as described in the Hypothetical Transportation Scenario would be constructed; 3) Certain levels of formation water, drilling muds and cuttings, etc., would be discharged into the marine environment as a result from the proposed sale (these items are detailed in Table IV.A.8.a-1; 4) assumed to be existing onshore facilities (i.e., oil and gas treating facilities, crude oil storage tanks, supply boat bases, and temporary support facilities) would be used, according to the Hypothetical Transportation Scenario and 5) a crew boat base would be built at Port San Luis (or an alternate site that is approved by State and local planning jurisdictions) to support hydrocarbon activities in the sale area. The environmental consequences are based on all these assumptions.

TABLE IV.A.1-1

RESOURCE ESTIMATES FOR THE CENTRAL AND NORTHERN; AND SOUTHERN CALIFORNIA PLANNING AREAS (CONDITIONAL MEAN)

	Billion Barrels of Oil	Trillion Cubic Feet of Gas
Central and Northern Resource* Estimate (Excludes tracts leased in OCS Sale No. 53)	1.23	1.53
Santa Maria Basin (Tracts leased in OCS Sale No. 53)	0.163	0.163
Southern California Reserves**	0.86	1.73
Southern California Resource Estimate (Tracts leased in previous sales)	0.29	0.57

*Resources - Concentrations of naturally occurring liquids or gaseous hydrocarbons in the Earth's crust, some part of which is currently or potentially economically extractable.

**Reserves - That part of the economic identified resource that is estimated from geologic evidence supported directly by engineering measurement.

Many variables would affect the types and locations of facilities that would be required to support the exploration, development, and production of oil and gas resources, if discovered. A number of facility combinations are possible. Among these variables are the policies and controls of local, regional, State and Federal governments, and of private (land rights), corporate, institutional, and industrial landholders.

Proposed Sale No. 73 is assumed to use certain facilities developed or expected to be developed as a result of existing Federal and State leases issued during the last 20-30 years. This could include sharing of pipelines (offshore and onshore), onshore operations bases, and certain platform facilities. All site-specific facilities developed for any Sale would be subject to all existing Federal, State, and local regulations, land use plans, policies, controls, etc.

3. Projected Transportation and Markets: The projected transportation and markets for oil and gas that is produced as a result of the implementation of the proposal are discussed fully in Section III.A.1.d and Yamasaki (1983).

4. Oil Spills

a. Oil Spill Risk Analysis Model: Oil spills are considered one of the single greatest potential impacting agents to the environment from offshore oil and gas activities. Oil spills can potentially impact resources ranging from biologically sensitive habitats and endangered species to recreational beaches or military operating areas. As a result, the U.S. Department of the Interior Geological Survey (USGS) has developed the Oil Spill Risk Analysis Model (LaBelle, et al., 1983; Smith, et al., 1982; Lanfear, et al., 1979) as a tool to aid in the overall understanding of the potential risk of oil spills to the environment from specific offshore oil and gas lease sales.

The model is a means of quantifying the potential risks of oil spills resulting from the proposed action, as well as from existing leases and oil imports. An understanding of the uncertainties and assumptions about both the data used as input to the model and the resultant output data is necessary in order to make the subsequent analyses meaningful.

The model assumptions include: 1) seasonally averaged oceanic surface currents and seasonal wind transition probabilities can be used to assess the probable trajectories of floating oil; 2) reasonable resource estimates can be made from knowledge of the general geologic formations where in some cases no test wells have been drilled; 3) the best estimate of what may happen in the future in terms of accident/oil spill rates can be based on past U.S. OCS activity and world-wide tankering activity; 4) the best exposure variable for risk assessment in all activity modes (platforms, tankers, and pipelines) is volume of oil produced and transported. The oil spill model is described in more detail in the reports mentioned above and briefly below.

Model Description. For this sale, the model study area (from the Washington-Oregon State line to the Mexican border) is overlaid with a 420 by 590 grid system, allowing a resolution of approximately 2-3 km of coastline. This shoreline is broken up into 65 land segments approximately 32-48 km long

(20-30 miles) (Figure IV.A.4-1). This aids in the analysis of specific coastal areas where estuaries, harbors, or beaches may be located. Resources are selected, either at sea or onshore, as areas of key concern for use as "targets" of simulated spills (Figure IV.A.4-2). These targets can be designated vulnerable year-round or only during certain months, to account for migrating birds, for example. The proposed leasing area offshore is divided into 17 oil spill launch areas of roughly 16-20 lease tracts each. Oil spills are simulated from these launch areas as well as from existing lease areas in Southern and Central California (Figures IV.A.4-3, 4). Simulated oil spills are also launched along the proposed and existing tanker and pipeline routes in the study area. These tanker routes include foreign and Alaskan import crude tankering within the study area, in addition to those routes anticipated to result from the proposal. It is assumed that proposed Sale 73 oil will back-out an equal amount of Alaskan oil going to California refineries (75 percent of Sale 73 oil).

There are, however, an unknown additional number of oil spills, not accounted for by the model, expected to occur from development of oil and gas resources in State tidelands and from other general vessel traffic (such as fishing or cargo vessels) in the study area. Transportation scenarios representing the "most likely" and "conditional mean" development levels and resource estimates are considered (Yamasaki, 1983), as well as an all-tankering transportation scenario.

The model keeps track of "hits" to both targets and land segments, simulating 2,000 spills (500 per season) from each launch area and along each transportation route segment. Simulated oil spill model runs terminate when the spill contacts land, crosses a model boundary, or remains at sea more than 30 days.

The driving forces for simulating a spill trajectory are surface ocean currents and winds. The surface ocean currents were obtained from the Dynalysis of Princeton model of circulation of the California Shelf (Blumberg, et al., 1982). The oceanographic data used in the Dynalysis study come from the National Oceanographic Data Center (NODC), the Fleet Numerical Oceaonography Center (FNOC), and the California Cooperative Fisheries Investigation (CalCOFI). The NODC and CalCOFI data are current through 1979. The FNOC data are current through 1980.

To obtain the oil spill movement the model uses 3.5 percent of the wind speed, rotated a variable angle (0°-25°) to the right depending on this speed (Samuels, W.B., et al., 1982). This vector is then added to the surface current velocity vector. Long-term wind data observed from four coastal stations: Monterey, Vandenberg, San Nicolas Island, and San Diego, (compiled by the National Weather Service), and one offshore buoy off Oregon are used to construct seasonal transition matrices which are sampled using a random (Monte Carlo) technique. Data from these stations were compared to ship wind data to appropriately divide the study area into wind zones. The transition matrix of the appropriate wind zone is then sampled during spill simulations. The model moves the oil as a point (a hypothetical, center of mass of an oil slick) in 3-hour increments. In reality, oil does not move as a point but rather as a mass with dimension (due to spreading, diffusion, and other factors). To account for the unknown slick dimensions, the assumption is made that if any part of a land segment is contacted, the entire

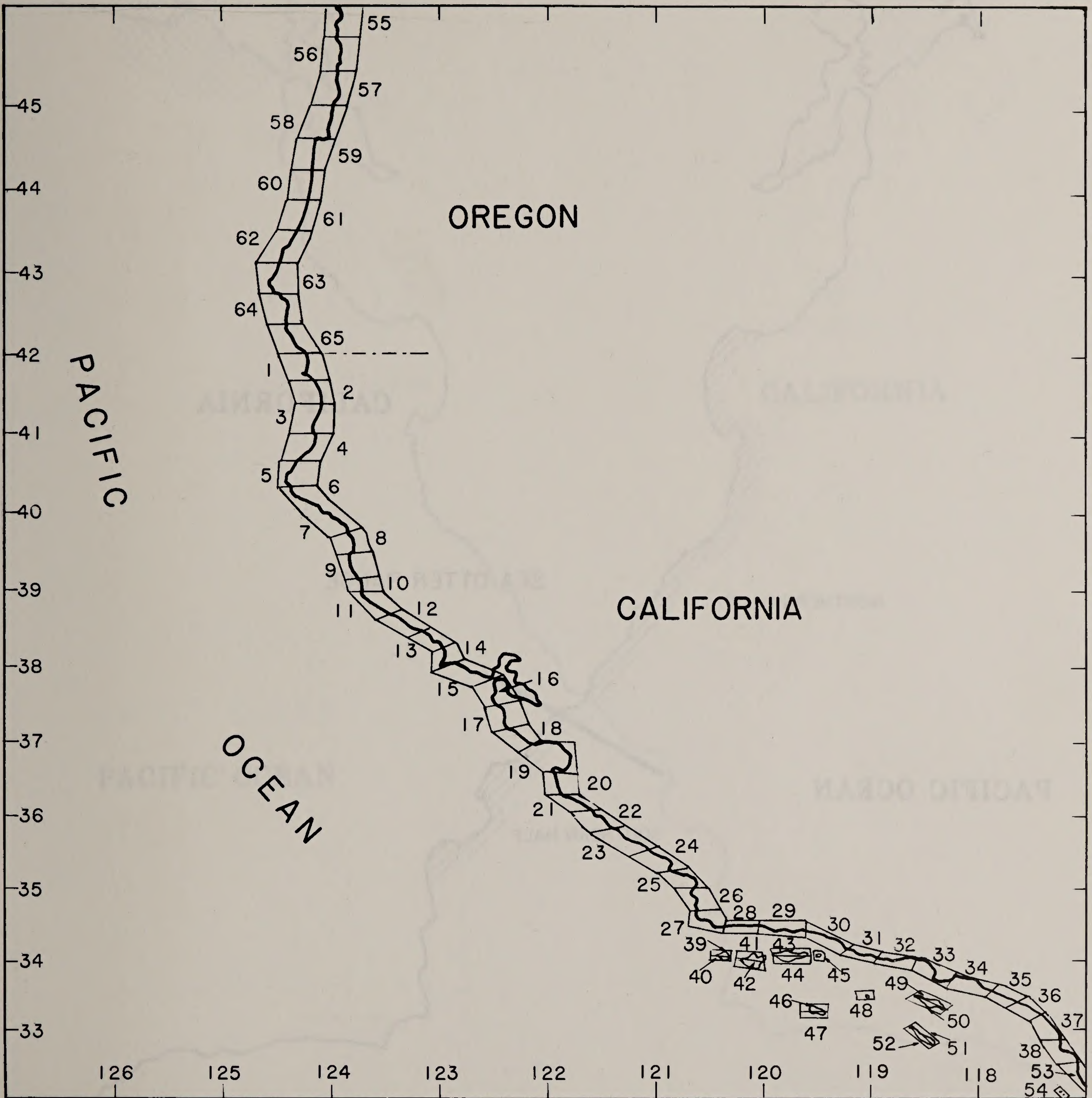

FIGURE IV. A. 4-1 MAP SHOWING THE DIVISION OF THE OREGON AND CALIFORNIA SHORELINES INTO 65 SEGMENTS OF APPROXIMATELY EQUAL LENGTHS.

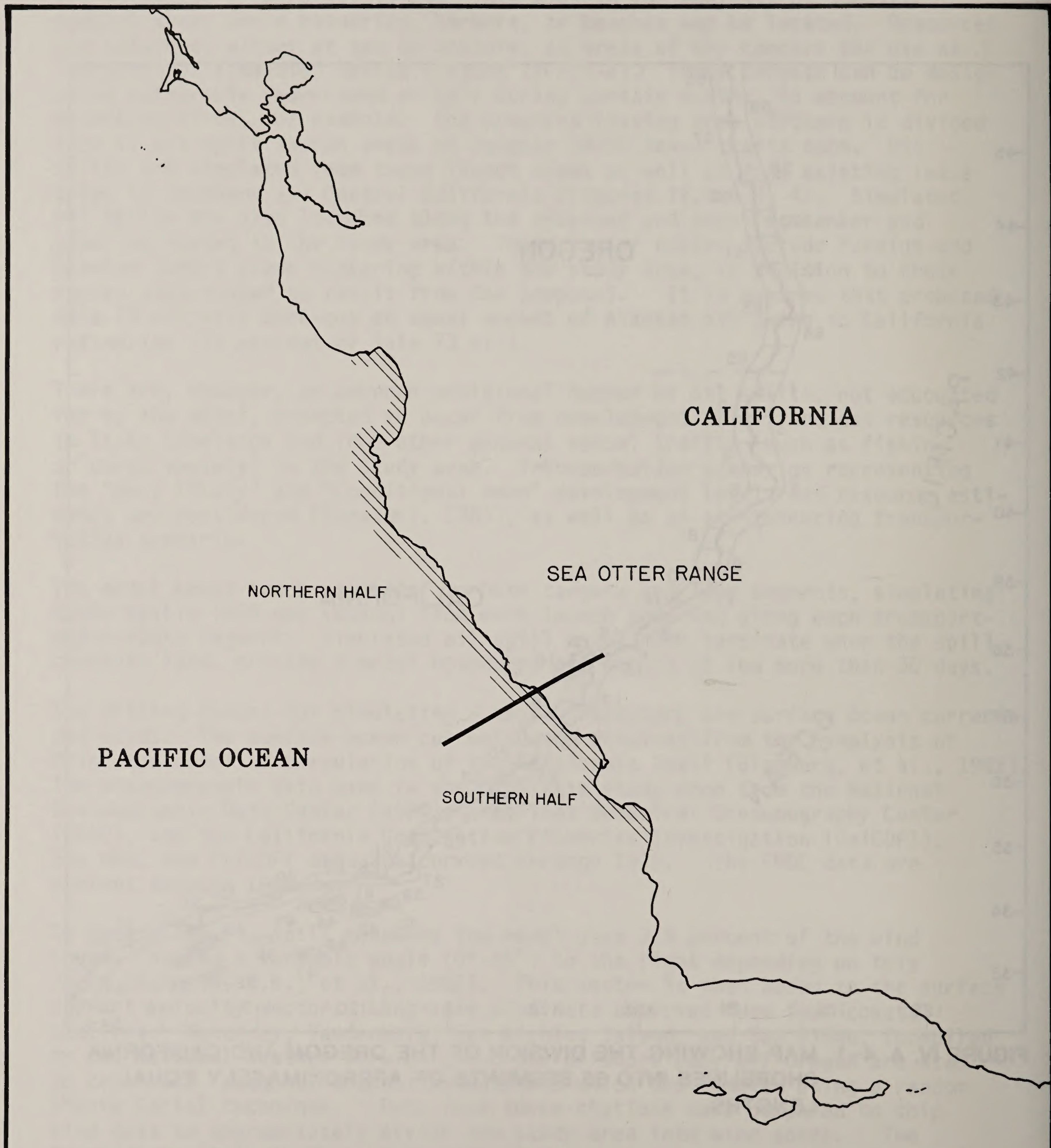

FIGURE IV.A.4-2 MAP SHOWING THE OIL SPILL MODEL TARGETS: TOTAL SEA OTTER RANGE; SEA OTTER RANGE NORTHERN HALF; SEA OTTER RANGE SOUTHERN HALF.

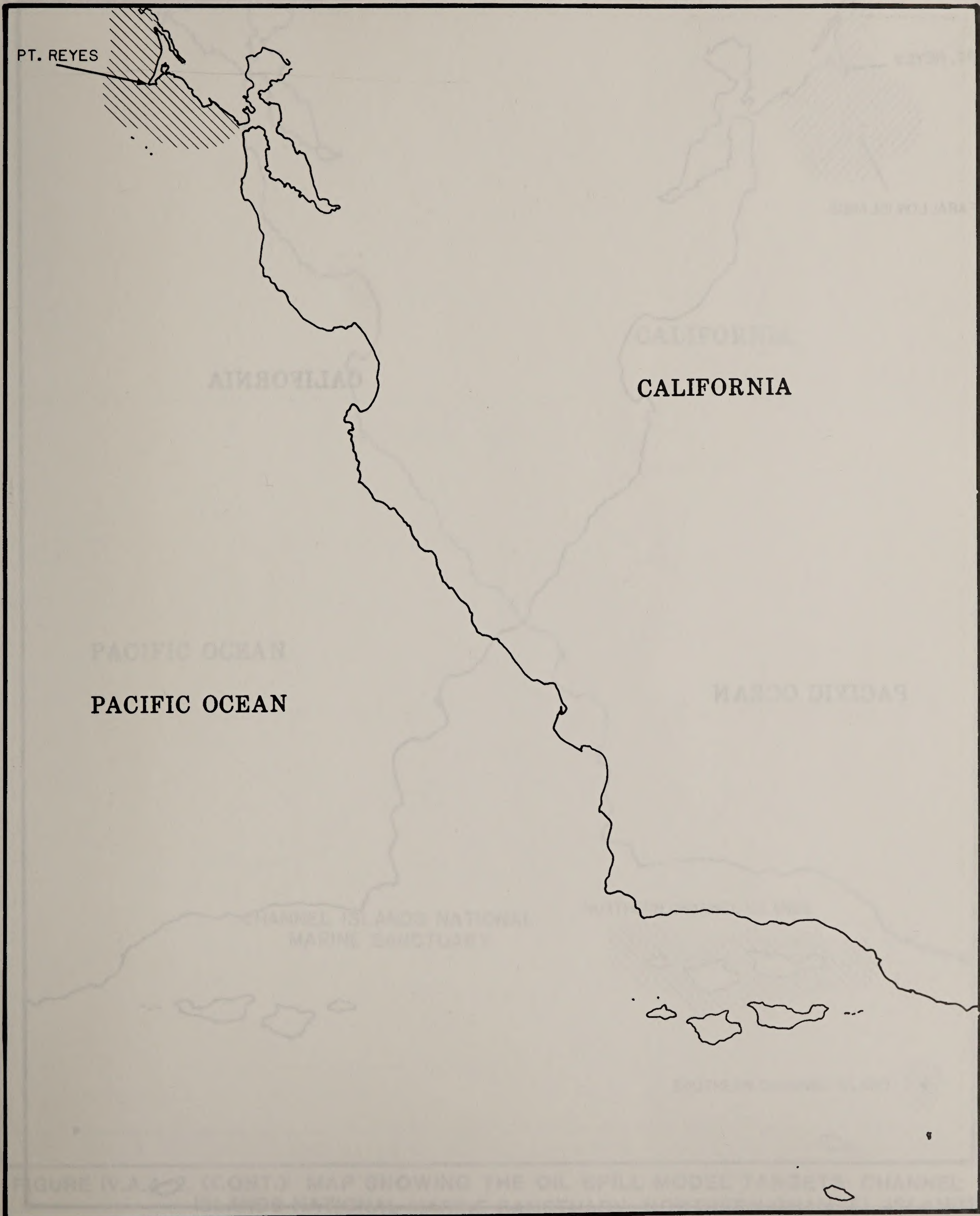

FIGURE IV.A.4-2 (CONT). MAP SHOWING THE OIL SPILL MODEL TARGET: PT. REYES WILDERNESS AREA.

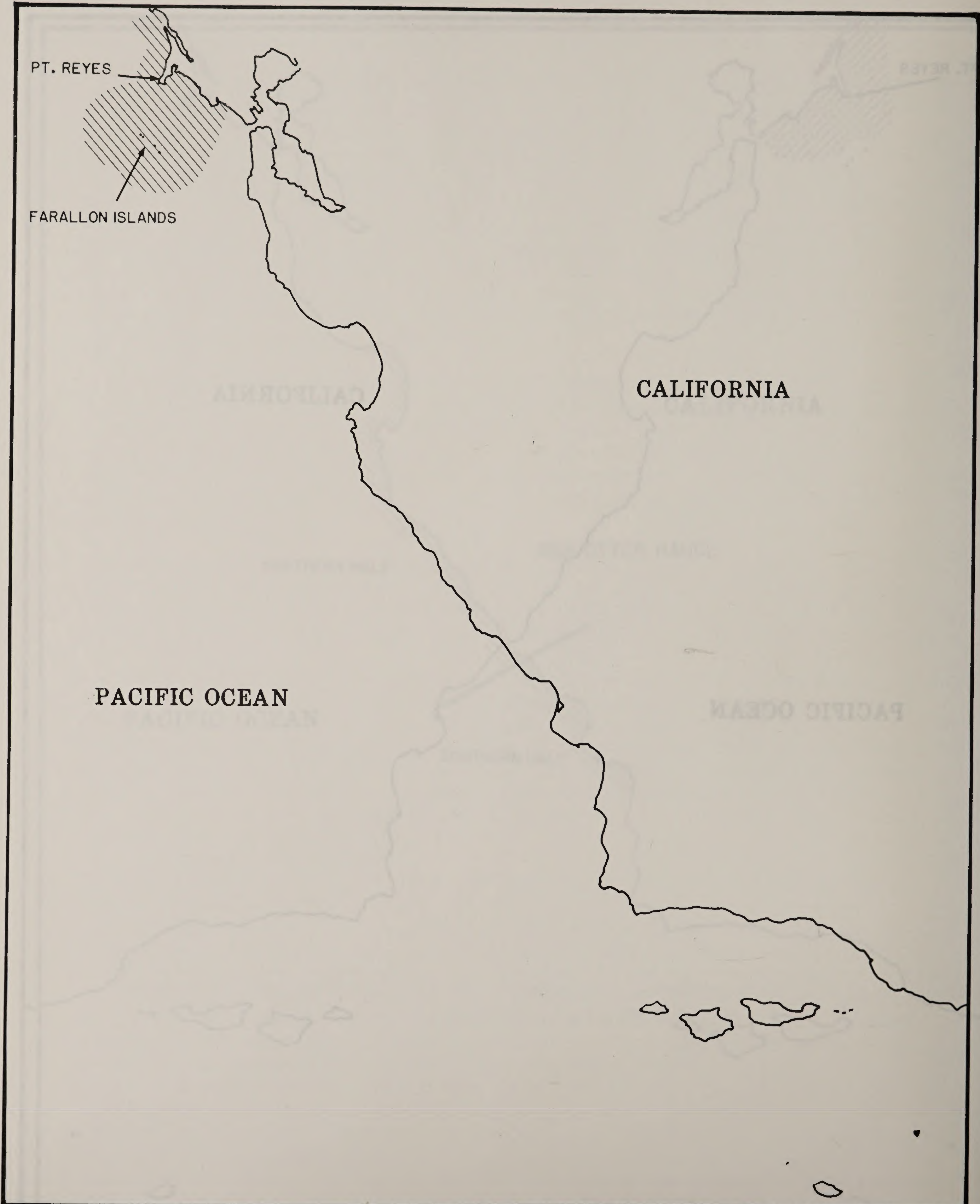

FIGURE IV.A.4-2 (CONT.) MAP SHOWING THE OIL SPILL MODEL TARGET: PT. REYES-FARALLON ISLANDS NATIONAL MARINE SANCTUARY.

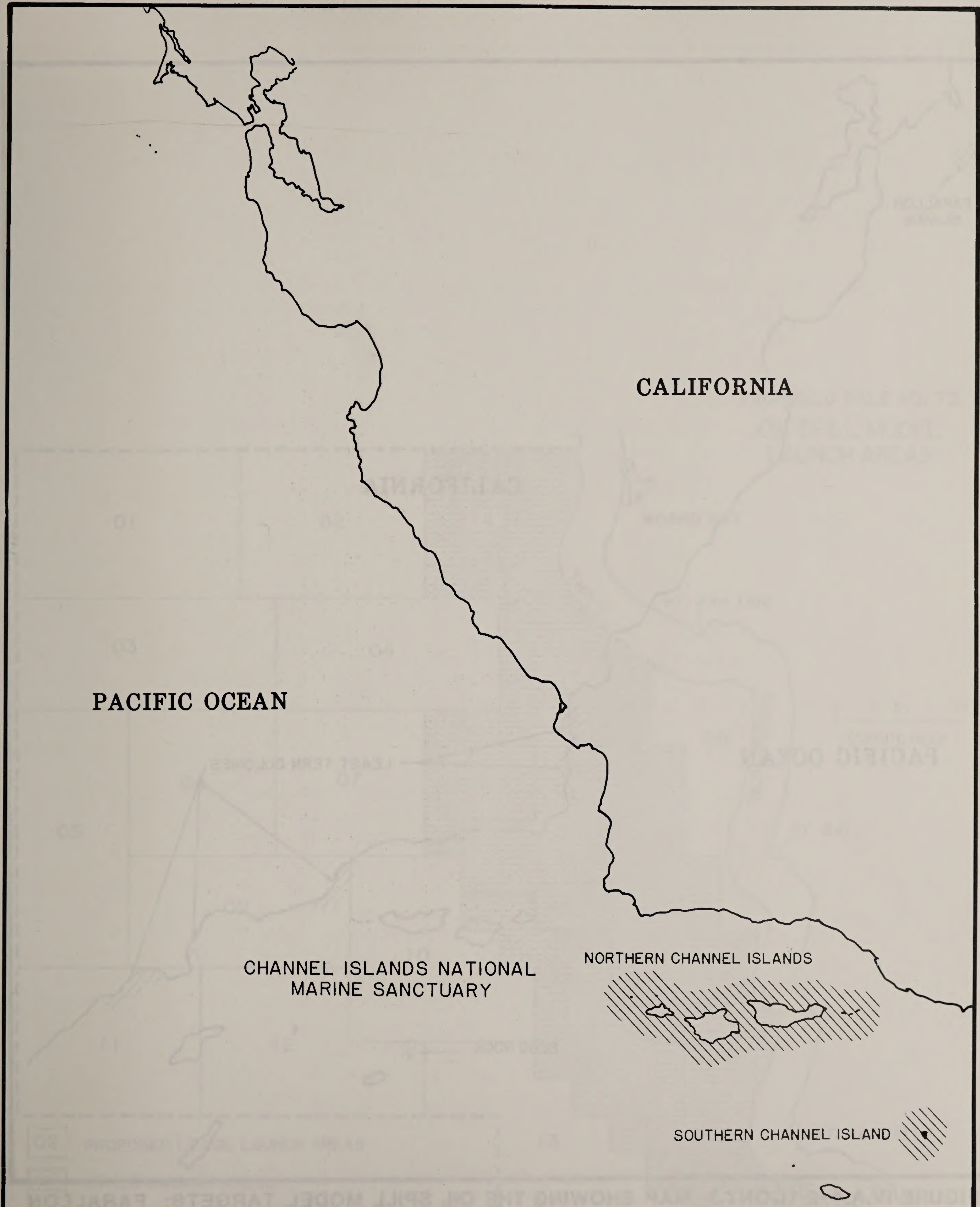

FIGURE IV.A.4-2. (CONT.) MAP SHOWING THE OIL SPILL MODEL TARGETS: CHANNEL ISLANDS NATIONAL MARINE SANCTUARY; NORTHERN CHANNEL ISLANDS (6-MILE PERIMETER); SOUTHERN CHANNEL ISLAND (6-MILE PERIMETER) AROUND SANTA BARBARA ISLAND).

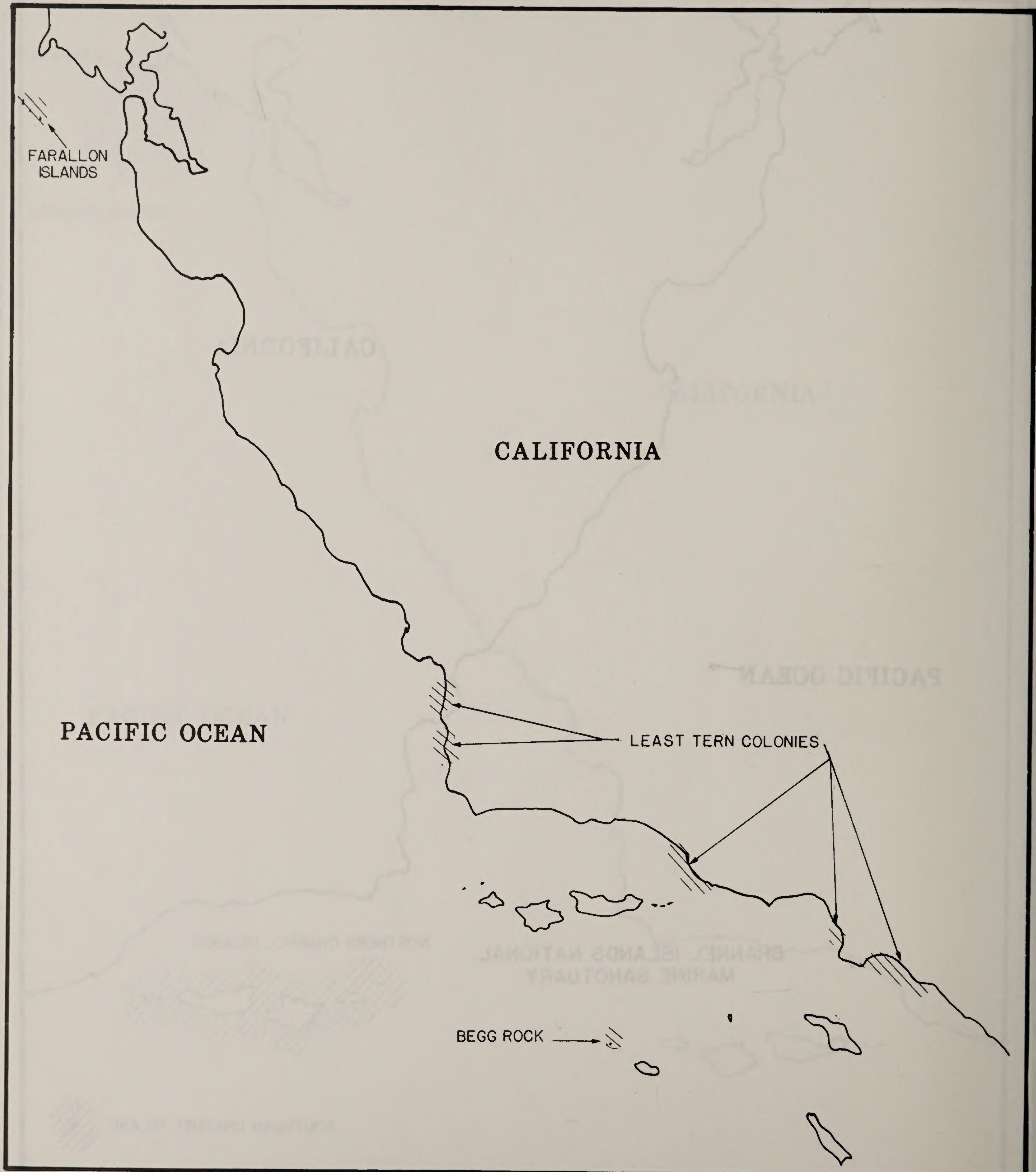

FIGURE IV.A.4-2 (CONT.) MAP SHOWING THE OIL SPILL MODEL TARGETS: FARALLON ISLANDS; LEAST TERN COLONIES; BEGG ROCK.

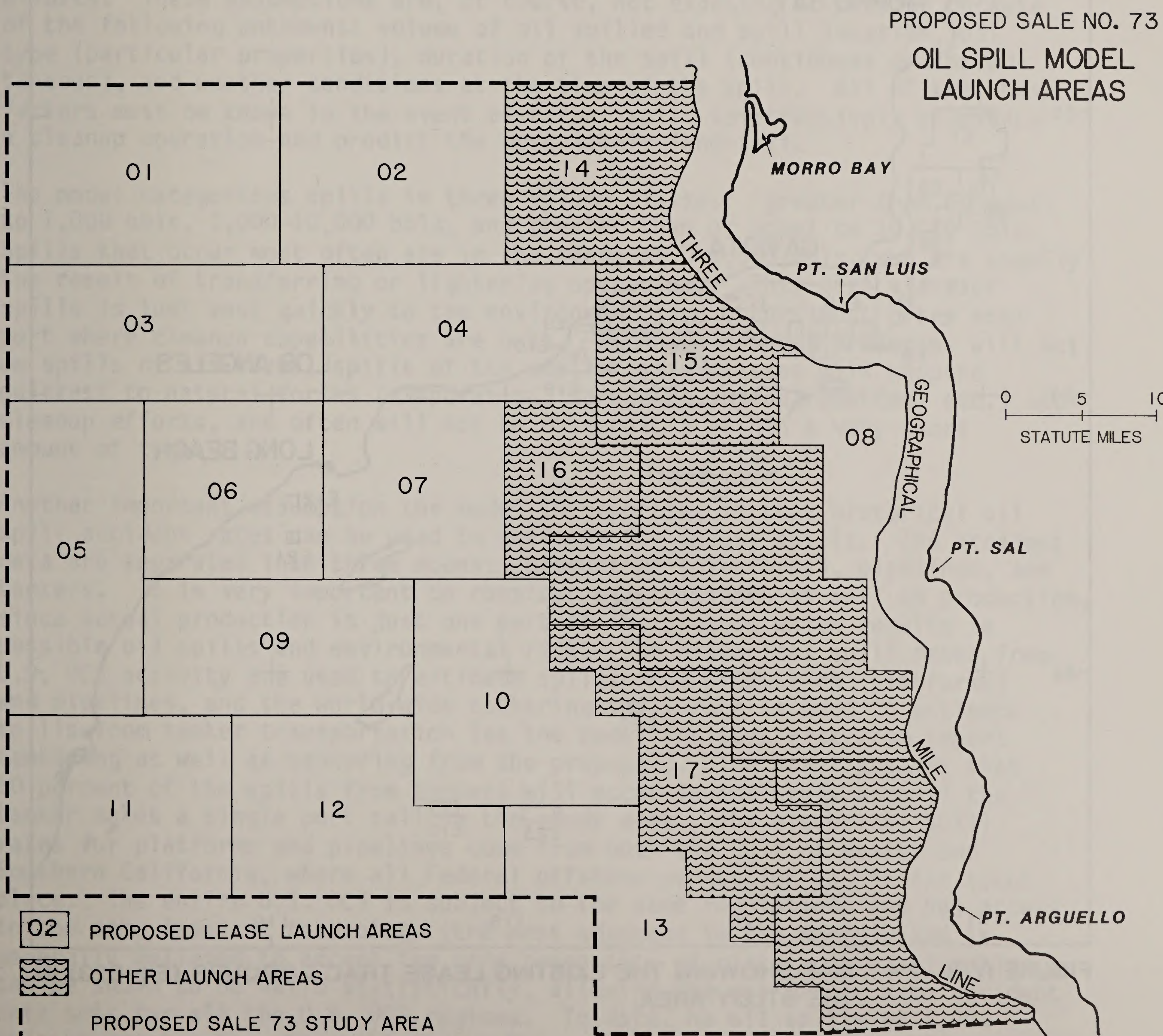

FIGURE IV.A.4-3. MAP SHOWING OIL SPILL MODEL LAUNCH AREAS.

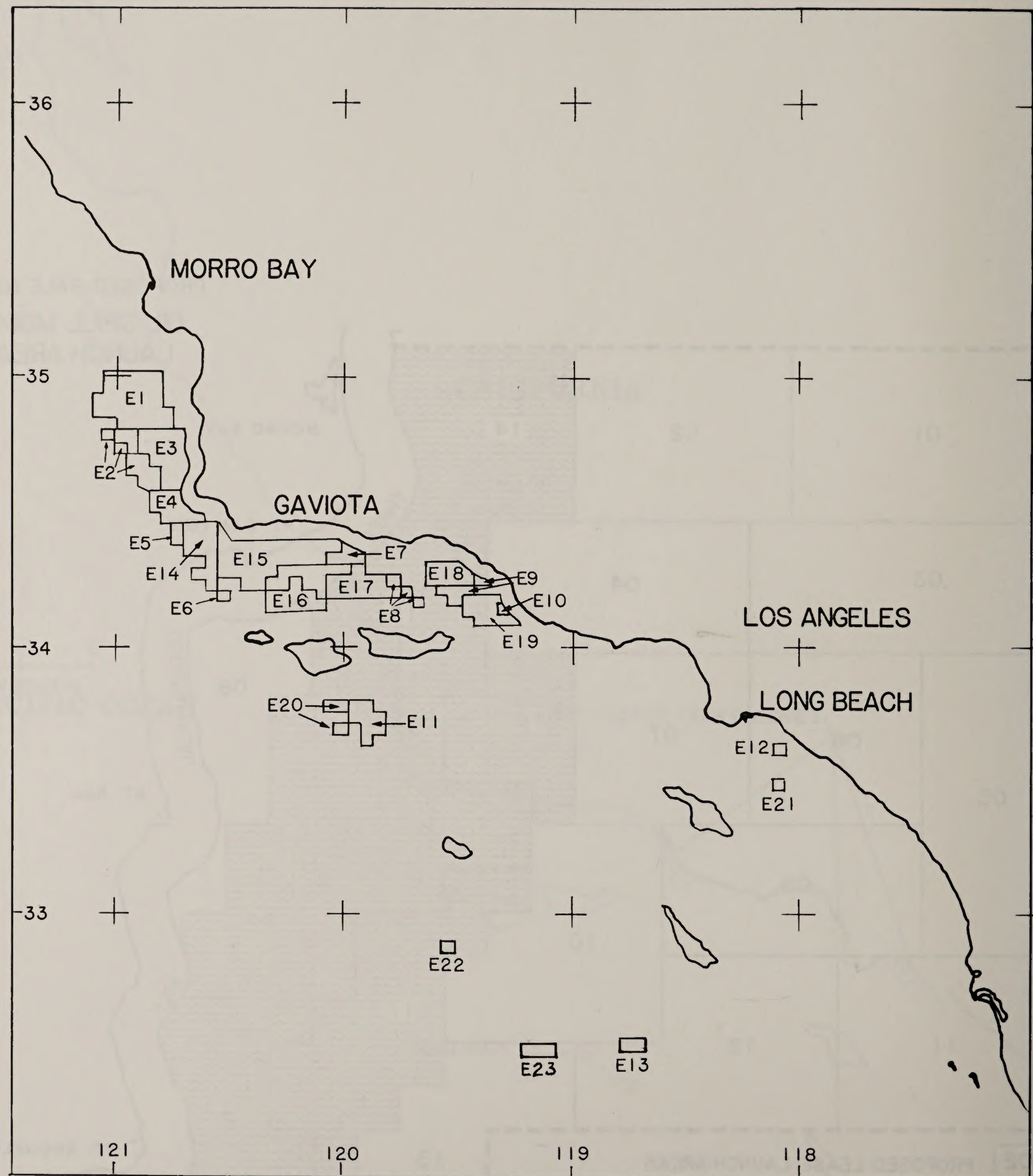

FIGURE IV.A. 4-4 MAP SHOWING THE EXISTING LEASE TRACT GROUPS (E1-E23) IN THE STUDY AREA.

segment including every estuary, harbor, or river in that segment will be contacted. This approach more than adequately makes up for the model's treatment of an oil spill as a point-source, in light of the fact that most of the estuaries have openings on the order of tens to hundreds of meters - (Table III.B.7-3) versus the land segment dimensions of 32-48 km. The Interior Department is considering incorporating an algorithm that would simulate evaporation, dispersion, mousse formation and spreading of spilled oil.

The model does not account explicitly for cleanup possibilities, evaporation, spreading, sinking, and other factors, thereby adding to the conservative nature of the model. The model records contacts at 3, 10, and 30 days; allowing implicit assumptions about weathering, evaporation, and cleanup efforts. These assumptions are, of course, not exacting or precise because of the following unknowns: volume of oil spilled and spill location, oil type (particular properties), duration of the spill (continuous or instantaneous), and weather conditions at the time of the spill. All of the above factors must be known in the event of a real spill to effectively undertake a cleanup operation and predict the most likely land-fall.

The model categorizes spills in three volume classes: greater than or equal to 1,000 bbls, 1,000-10,000 bbls, and greater than or equal to 10,000 bbls. Spills that occur most often are in the range of 0-1,000 bbls, and are usually the result of transferring or lightering operations. This size class of spills is lost most quickly to the environment, and occurs most often near port where cleanup capabilities are best. Although natural processes will act on spills of all sizes, spills of the smaller size classes will respond quickest to natural forces (evaporation, spreading, biodegradation, etc.) and cleanup efforts, and often will not be discernible within a very short amount of time.

Another important assumption the model incorporates is that historical oil spill accident rates can be used to estimate the future spills. The accident data are separated into three modes: production (platforms), pipelines, and tankers. It is very important to consider oil transport as well as production, since actual production is just one part of the process which results in possible oil spills and environmental risk. The historical spill rates from U.S. OCS activity are used to estimate spills from production (platforms) and pipelines, and the world-wide tankering spill rate is used to estimate spills from tanker transportation (as the model includes risk from import tankering as well as tankering from the proposal). The model assumes that 50 percent of the spills from tankers will occur in the study area if the tanker makes a single port call in the study area. The historical spill rates for platforms and pipelines come from both the Gulf of Mexico and Southern California, where all Federal offshore production has so far taken place. The entire U.S. OCS is subject to the same regulations and has access to the same level of technology (the most advanced in the world), and is generally believed to accept the same propensity of risk. This assumption can be shown to be valid statistically, allowing the use of the same accident data sets for all the U.S. OCS regions. To date, no oil spills of 1,000 bbls or greater have been attributed to geohazards (earthquakes, slumps, shallow gas) on the U.S. OCS. The historical spill data (Future's Group, 1982) have shown significant improvement over the past 10 years. A trend has been detected for the platform rate, and is incorporated. More complete, updated data have been incorporated for all modes, resulting in new rates since previous sales (Lanfear, Kenneth J., and David E. Amstutz, 1983). This improving record is likely a result of advancing technology of the industry, as well as the more rigorous environmental regulations. The accident spill rates are shown in Table IV.A.4-1.

The model basically combines two analyses. First oil spill trajectories are simulated, resulting in "conditional" probabilities of oil spill contacts to land segments and targets. The probabilities are conditioned with the assumption that a spill has occurred, and incorporate only wind and current data. The conditional probabilities are then combined with the estimated resource potential (oil volume) and the accident spill rate for the particular mode used to produce and transport the oil to shore, to yield joint or final probabilities of oil spill occurrence, and the mean number of spills occurring, as well as ocurrence and contact.

The resource estimates are critical in determining the oil spill model results. The resource estimates were broken down into two categories, Full Development (conditional mean) and Most Likely. The Full Development represents the amount of oil and gas predicted to be found for the whole study area (excluding state waters) if any oil and gas is actually present. It is a high case estimate and includes resources to be found as a result of this sale and future sales. The Most Likely estimate is approximately 30 percent of the Full Development, representing the amount of resources expected to be found and developed as a result of Proposed Sale No. 73. The analyses done for this report are based on the Most Likely estimates and the Full Development estimate. It is the Most Likely that is expected to occur as a result of the Proposal.

It is important to keep in mind that oil spill "contact" does not imply oil spill "impact", as lack of contact does not imply no impact, (i.e., fish may be impacted during an oil spill even though no oil has contacted any shoreline areas). "Impact" analyses are discussed in the specific sections concerning that particular resource, where the analyst considers the particular resource characteristics when determining impacts from oil spills.

Oil Spill Model Results. This model attempts to predict statistically what is likely to occur given the large state of uncertainty of such factors as the resource estimates, transportation scenarios, wind and current conditions at the time of an oil spill, changing industry technology, changing economic conditions and subsequent oil and gas prices and demand, and political climate. For example, of the 110 tracts offered in Sale No. 68 (Southern California) only 29 actual leases were issued as a result of the sale (June 11, 1982).

The actual environmental impacts may therefore prove significantly higher or lower than discussed in this report. Table IV.A.4-2 is a summary of the oil spill model results, and Appendix F shows of the oil spill model data for both the resource targets and land segments in more detail. The very conservative attitude was taken in the analyses that a 25 percent probability or greater of one or more spills occurring and contacting land segments or targets implies a high probability and therefore is expected.

TABLE IV.A.4-1

OIL SPILL ACCIDENT SPILL RATE

(Spills Per Billion Barrels Produced or Transported)

(Lanfear and Amstutz, 1983)

Mode	≥ 1,000 bbls	1,000-10,000 bbls	≥ 10,000 bbls
Platforms	1.00	0.56	0.44
Pipelines	1.60	0.93	0.67
Tankers	1.30	0.65	0.65

TABLE IV.A.4-2

OIL SPILL OCCURRENCES AND THE PROBABILITIES
OF ONE OR MORE SPILLS ESTIMATED OVER THE EXPECTED
LIFE OF PROPOSED SALE NO. 73, FROM THE PROPOSAL, EXISTING FEDERAL LEASES
AND FROM EXISTING CRUDE OIL IMPORT TANKERING INTO THE STUDY AREA

	Expected Number of Spills (% Probability of one or more spills)					
	≥1,000 bbls		1,000-10,000 bbls		≥10,000 bbls	
MOST LIKELY CASE						
Total for the Proposal	0.90	(59%)	0.50	(39%)	0.40	(33%)
Tanker Transportation of Crude Oil Imports (with the Proposal)						
Total	3.61	(97%)	1.80	(83%)	1.80	(83%)
Foreign	0.55	(42%)	0.27	(24%)	0.27	(24%)
*Alaskan	3.06	(95%)	1.53	(78%)	1.53	(78%)
CONDITIONAL MEAN CASE						
Total for the Proposal	3.00	(95%)	1.67	(81%)	1.32	(73%)
Tanker Transportation of Crude Oil Imports (with the Proposal)						
Total	2.63	(93%)	1.31	(73%)	1.31	(73%)
Foreign	0.55	(42%)	0.27	(24%)	0.27	(24%)
*Alaskan	2.08	(88%)	1.04	(65%)	1.04	(65%)
EXISTING FEDERAL LEASES (All of California OCS)	3.41	(88%)	1.95	(71%)	1.46	(77%)

* The volume of Alaskan crude oil being imported to California refineries over the 25-year expected life of the Proposal is assumed to displace (back-out) the volume of oil anticipated from the Proposal (both Most Likely and Conditional Mean Cases) going to California refineries. It is assumed that 75% of the oil from the Proposal will go to California refineries and 25% will go to the Gulf of Mexico refineries. This displacement will result in a decrease of Alaskan oil to California refineries by 4% (Most Likely Case), and 18% (Conditional Mean Case). See Section II.A.1.d. The volume of foreign and Alaskan crude is based on the 1982 receipt of California refineries (CEC, 1983).

MOST LIKELY CASE

Proposed Sale No. 73 Area

The most likely case incorporates the volume of resources and corresponding level of development expected to occur as a result of this Proposed Sale. It is estimated that the Proposal will result in one large oil spill (≥ 1,000 bbls) and one very large spill (≥ 10,000 bbls). It is important to note that these estimates are for oil spill occurrences, not contacts or impacts. These estimations are based on the numbers statistically reported by the oil spill model (Table IV.A.4-2) of a 59 percent probability of one or more large spills (0.90 mean spills), and a 33 percent probability of one or more very large spills (0.40 mean spills), and the previously discussed assumption made for this environmental analysis whereby an event with a probability of 25 percent or greater of occurring is expected. The model estimations for the individual land segments (Appendix F) in the Proposed Sale area (#24-#27) indicate no large spills occurring and contacting them from the Proposal. The pobabilities of one or more spills occurring and contacting these segments ranged from less than .5 percent to 7 percent, and the mean number of spills occurring and contacting ranged from 0.0 to 0.1 (within 30 days). Although no contact is expected, segment #25, representing the Port San Luis area, had the highest probability (7 percent) of oil spill contact of those segments in the Proposed Sale area.

The resources designated as model targets within the Proposed Sale area are the sea otter range (which extends well north of the proposal area), and the least tern colonies (two of the five areas designated are within the proposal area). The model estimates no spill occurring and contacting these targets, as the sea otter range is estimated to have 0.1 oil spills occurring and contacting it, and a 13 percent probability of one or more spills occurring and contacting it, and the least tern target estimates are for 0.0 spills occurring and contacting, within 30 days.

<u>Summary</u>. The model estimates one large spill and one very large spill will occur as a result of the Proposal. The individual land segments and resource targets in the Proposal area show no significant risk of oil spill contact expected from the Proposal. The Port San Luis area (land segment #25) shows the highest risk of oil spill contact (7 percent) within the Proposal area.

AREAS OUTSIDE THE PROPOSED SALE AREA

<u>Oregon</u>. The oil spill risk analysis model was run for all the California and Oregon OCS. This model used the Dynalysis of Princeton Model, which was run for the entire U.S. West Coast (and most of Baja California), as input for ocean circulation (currents), and included a wind buoy offshore Oregon for the wind data for the northern wind province. The oil spill model included 11 land segments covering the entire Oregon coast (segments #55-65). The results of the model show an estimated mean number of zero spills (≥ 1,000 bbls), with a less than .05 probability of one or more spills occurring and contacting <u>any</u> of the Oregon land segments in any time frame (3, 10, or 30 days), as a result of the Proposal. The model did show, however, a very small risk (up to 0.1 spills) to the Oregon segments due to import tankering of crude oil from Alaska going to California refineries. Overall, no oil spill impacts are expected to the Oregon coast from the Proposed Lease Sale No. 73.

California Coast North of the Proposed Sale Area. The oil spill model estimates no spills occurring and contacting any of the land segments north of the proposed sale area, as a result of the Proposal. The probability of occurrence and contact within 30 days ranged from less than .5 percensto 1 percent, and the mean number of spill contacts was 0.0 (land segments 1-23). The target areas north of the proposed sale area show no spills expected to occur and contact them within 30 days, as a result of the Proposal. The probabilities ranged from less than .5 percent (Farallon Islands) to 13 percent for the entire sea otter range (partially in the sale area). The southern half of the sea otter range, although still not estimated to have a spill contact, showed most of this potential risk of contact, with an 11 percent probability of contact of one or more spills (0.1 spills). Several of these land segments do, however, show significant risk of oil spill occurrence and contact as a result of existing activities and import tankering.

Santa Barbara Channel. The Santa Barbara Channel is bounded by parts of Santa Barbara and Ventura Counties on the north, and the four northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz, and Anacapa), an area of critical ecological concern, on the south. The Channel Islands National Marine Sanctuary includes these four northern islands and Santa Barbara Island (to the south), and extends six miles around these islands. The Sanctuary, including the six-mile buffer, was designated as three targets to the oilspill model - total Marine sanctuary, northern islands, and southern island (Santa Barbara Island). It is estimated that one spill will occur and contact the northern islands of the Sanctuary, as a probability of 26 percent of one or more spills occurring and contacting (0.3 mean spills) exists as a result of the Proposal.

The land segments in the Channel area (#'s 28-30, 39-45) show no spills estimated to occur and contact them. The segment with the highest risk, however, for the entire area is #39, the northern side of San Miguel Island. The model estimates a 14 percent probability of one or more spills occurring and contacting the northern side of the island, and 0.1 oil spills occurring and contacting it.

Conclusions - Most Likely Case. The number of large spills ($\geq$ 1,000 bbls) and very large spills ($\geq$ 10,000 bbls) estimated to occur as a result of the Proposal are 1 (0.90 statistically) and 1 (0.40 statistically), and a 59 percent and 33 percent probability of one or more spills, respectively. One spill is estimated to occur and contact the northern portion of the Channel Islands Marine Sanctuary. Although most areas are not estimated to be contacted by a spill resulting from Proposed Lease Sale No. 73 activities, a spill is always theoretically possible wherever offshore oil activity is present, and increases with increased levels of activity.

Cumulative - Most Likely Case. The oil spill model estimates 3 (3.41) large spills ($\geq$ 1,000 bbls) from existing federal leases, and 4 (3.61) from tanker crude oil imports into California, over the 25-year expected life of the Proposal. The Proposal is estimated to result in 1 (0.90) large spill, or an additional 13 percent risk of a large oil spill to California. For very large spills ($\geq$ 10,000 bbls) the model estimates 1 (1.46) spills occurring as a result of existing federal leases, and 2 (1.80) spills from tanker crude oil imports into California. The Proposal is estimated to result in less than 1 (0.40) very large spills, representing an additional risk of 13 percent. This indicates that Proposed Sale No. 73 adds a small, but significant additional risk of an oil spill occurring in California. There is significant oil spill risk to several land segments and targets in California, from existing activities, import tankering, and the Proposal. The following targets are estimated to have one or more spills occurring and contacting them during the life of the Proposal: the Channel Islands Marine Sanctuary, Pt. Reyes Marine Sanctuary, Pt. Reyes Wilderness area, and the Least Tern areas (Appendix F).

TOTAL DEVELOPMENT CASE (Conditional Mean)

Proposed Sale No. 73 Area

The full development case incorporates the conditional mean resource estimates and the corresponding level of development. This represents the amount of resources to be found and developed from full leasing of the area, including the Proposed Sale as well as all future sales. It is considered very unlikely that discovery of this level of resource volume (and subsequent development activity) would actually result.

It is estimated for the full development case that the Proposal will result in three large and one very large spills during the 25-year expected life of the Proposal (Table IV.A.4-2).

The model estimations for the individual land segments (Appendix F) in the Proposed Sale area (#24-#27) indicate no large spills occurring and contacting them within 30 days, from the Proposal. The probabilities of one or more spills occurring and contacting these segments ranged from 2 percent to 14 percent, and the mean number of oil spills occurring and contacting them ranged from 0.0 to 0.2 spills. Although no contact is expected, segment #25, representing the Port San Luis area, had the highest probability (14 percent) of oil spill contact (of those segments within the Proposed Sale area) from the Proposal.

The resources designated as model targets within the Proposal area are the sea otter range (extending well north of the Proposal area), and the least tern colonies (two of the five areas designated are within the Proposal area). The model estimates no spills occurring and contacting these targets, as a result of the Proposal. The estimates for the sea otter range are 0.3 spills occurring and contacting it, and a 24 percent probability of one or more spills occurring and contacting it (within 30 days). The estimates for the least tern areas are 0.1 spills and a probability of 10 percent of one or more spills occurring and contacting it (within 30 days).

Summary. The model estimates 3 large and 1 very large spill occurring as a result of the Proposal. The individual land segments and resource targets show no significant risk of oil spill contact expected from the Proposal. The Port San Luis area (segment #25) shows the highest risk of oil spill contact (14 percent) of any land segments within the Proposed Sale area. Although the sea otter range is not estimated to be contacted by any oil spills, there is significant potential of contact as a 24 percent probability of contact by one or more spills occurring, is estimated.

Areas Outside the Proposed Sale Area

Oregon. The oil spill model includes eleven land segments (#55-65) covering the entire Oregon coast. The model estimates no spills occurring and contacting any of these segments as a result of the Proposal. The model did indicate, however, a small amount of risk to the Oregon coast from tankering of Alaskan crude to California refineries.

California Coast North of the Proposed Sale Area. The oil spill model estimates no spills occurring and contacting any land segments in California north of the Proposal area, as a result of the Proposal. The probability of occurrence and contact within 30 days ranged from less than .5 percent to 4 percent (segments 1-23).

The target areas north of the Proposed Sale area show no spills expected to occur and contact them within 30 days, as a result of the Proposal. The probabilities of occurrence and contact of one or more spills ranged from less than .5 percent (Farallon Islands) to 24 percent (sea otter range). The southern half of the sea otter range, showed most of this potential risk of contact, with a 21 percent probability of spill occurrence and contact (0.2 mean spills).

Santa Barbara Channel. The Channel Islands National Marine Sanctuary (the five Channel Islands plus a 6-mile distance around the Islands) was designated as a target. The oil spill model estimates 1 spill will occur and contact the Channel Islands. All of this risk is to the northern four islands (San Miguel, Santa Rosa, Santa Cruz, and Anacapa). The probability of occurrence and contact of one or more spills is 66 percent (1.1 mean spills) within 30 days.

The land segments in the Channel (#28-30, 39-45) show only one segment, #39, estimated to have one spill occurring and contacting it as a result of the Proposal, within 30 days. This segment is the northern side of San Miguel Island. Although no contact is expected, segment #41, representing the northern side of Santa Rosa Island, is estimated to have the second greatest risk with a 13 percent probability of occurrence and contact of a spill within 30 days, from the Proposal.

Conclusions - Full Development Case. It is estimated that 3 (3.00 statistically) large spills (≥ 1,000 bbls) and 1 (1.32 statistically) very large spills (≥ 10,000 bbls) will occur as a result of the Proposal. The probability of one or more spills occurring are 95 percent for large spills, and 73% for very large spills.

The Channel Islands Marine Sanctuary is estimated to have one spill occur and contact it, and a 66 percent probability of one or more spills occurring and contacting it as a result of the Proposal. Land segment #39 (the northern side of San Miguel Island) is estimated to have one spill occurring and contacting it, and a 40 percent probability of one or more spills occurring and contacting it.

Cumulative - Full Development Case. The oil spill model estimates 3 (3.41) large spills from existing federal leases, and 3 (2.63) large spills from tanker imports of crude into California. The Proposal is estimated to result in 3 (3.00) large spills, thereby adding a 50 percent risk of a large spill. The Proposal would add a 48 percent risk of a very large spill. Examining the environment with the Proposal, indicates the Proposal represents 33 percent of the risk of a large spill, and 32 percent of the risk of a very large spill. The Proposal would therefore significantly increase the risk of oil spills to the study area (Full Development Case). In addition, there is significant oil spill risk to many land segments and targets in California from existing activities, tanker importation of crude oil, and the Proposal. The following targets are estimated to have one or more oil spills occurring and contacting them during the life of the Proposal: the sea otter range, the Channel Islands Marine Sanctuary, Pt. Reyes Marine Sanctuary, Pt. Reyes Wilderness area, and the Least Tern areas.

b. Effects on Marine Life: The literature on the effects of oil on marine life continues to grow and the emphasis in research continues to shift away from static acute (96 hour) toxicity bioassays. The overview of hydrocarbon effects on marine organisms presented in the FEIS for OCS Lease Sale No. 68 (Section IV.A.1.c) (BLM, 1981) should be referred to by the reader and this section expands upon that literature.

Petroleum hydrocarbons may have short-term acute and long-term chronic effects on marine organisms. The short-term, acute effects are those usually associated with accidental oil spills while the long-term chronic effects, which are less investigated, are usually associated with the natural phenomenon of oil seeps, the slow dissolution of sediment trapped oil spill residues after a spill or large volume municipal-industrial effluent discharges. Acute effects are generally measured in the laboratory by 96-hour (or shorter) bioassays wherein an organism is exposed to the toxic substance for 96 hours. Results of these bioassays must be interpreted with some caution when attempting to predict the effects on marine organisms outside the laboratory environment. Many factors affect behavior of oil spilled in the ocean. These combine with biological factors such as age, reproductive maturity and physiological stress from nonpetroleum pollutants and affect individual organisms' response to petroleum in the natural environment. The problems associated with maintaining organisms in long-term laboratory bioassays and monitoring a wide spectrum of possible effects other than death have kept the amount of information from which to predict long-term natural effects sparse. These long-term sublethal effects of chronic exposure to low levels of petroleum hydrocarbons are less dramatic than the death response to short-term, high doses. However, in relation to maintaining populations of marine organisms, sublethal effects such as reduced reproduction may prove to be much more important.

The uptake and effects of crude oil and components of crude oil have been extensively investigated during the last decade. The reader is referred to Anderson (1975), Malins (1977), Wolfe (1977), Neff (1979) and Neff and Anderson (1981) for good in-depth reviews of much of the research. In addition studies are in progress funded by the Minerals Management Service (MMS), National Marine Fisheries Service, and Environmental Protection Agency. Concern is still expressed regarding the possible bioamplification of hydrocarbons ingested by marine organisms. Bioamplification is the increase in concentration of a material as it moves up the food chain from the primary producers (plants-algae-phytoplankton) to the top predators (marine mammals-man). This is a different process than bioaccumulation in which organisms take up (by eating, etc.) a material but the concentration at different trophic levels remains approximately the same. Research to date has indicated most marine organisms <u>bioaccumulate</u> both hydrocarbons and trace metals but bioamplification has been demonstrated for only a few metals (most notably methylated mercury).

Effects on Microfauna and Microflora.(Bacteria, Phytoplankton, Zooplankton).

The role of bacteria in reducing the amount of spilled oil may be significant. Colwell and Walker (1977) have demonstrated that up to 90 percent of nonvolatile components of crude oil may be biodegraded by microbial action. Recent consideration of the role of microbes in oceanic food chains (Morita, 1977; Pomeroy, 1980) and consequences of hydrocarbon effects on either microbial photosynthesis, metabolism, or species composition indicate the need to consider the response of microbes to spilled oil. In this regard, it is important to note the work of Atlas (1975) and Atlas and Bartha (1972) who noted that volatile components of some crude oils can delay or prevent biodegradation. Also, the response of marine microbial populations to spilled oil may depend in part on any previous exposure to oil. Walker and Colwell (1976) found that bacterial counts decreased in areas not previously exposed to oil whereas the counts increased in areas of chronic oil exposure. Atlas (1981) points out, however, that generally less than 0.1 percent of the microbial population in unpolluted habitats are hydrocarbon degrading while up to 100 percent of the microbial population may be capable of degrading hydrocarbon in oil-polluted ecosystems. In addition, there may be a succession of bacterial species in the microbial ecosystem (Horowitz, et al., 1975) due to differential abilities and/or ease in degrading the various classes of hydrocarbons found in crude oil (Atlas, 1981).

The effect of hydrocarbons on phytoplankton and zooplankton populations has been investigated in both laboratory and field studies in recent years. Results indicated enhanced growth of phytoplankton (see FEIS Sale No. 68 Section IV.A.1) when exposed to low concentrations of petroleum. However, in these experiments bacteria may have accounted for oxidation of hydrocarbons, increased CO_2, and subsequent stimulation of phytoplankton growth. Thus, there remains some question as to the actual amount of stimulation of phytoplankton caused by petroleum hydrocarbons. Recently, microalgae have been shown to degrade aromatic compounds (Cerniglia, et al., 1980) and further work may show phytoplankton to be a significant component of removing crude oil from the environment.

Numerous studies have been done on zooplankton of many phyla. Much of the work has been concerned with establishing acute toxicity levels. Comparison of the resulting data amoung phyla with an eye to generalizing lethal levels of hydrocarbons is difficult because most studies only specified initial concentrations of total oil and lack detail of oil composition or concentration-time relationships. Corner (1979) recently reviewed much of the available literature and details of studies to 1978 may be referenced there. Rinkevich and Loya (1977, 1979) have shown inhibition of settlement of planula larvae of the coral *Stylophora pistillata* when exposed to Iranian crude oil (concentration not specified). Planktonic larvae of *Mercenia*, a clam, were inhibited in growth when exposed to refined and crude oils between 0.22 and 4.2 mg/l (Byrne and Calder, 1977) while Winters, et al., (1977) demonstrated increased growth rate in mussel larvae at 10 ppm water soluble fraction of single hydrocarbons.

The great majority of work with zooplankton has been done with crustacean larval and adults. The toxicity data indicate short-term (4 day) LC50 range of low (2-10 ppm to moderate (100 ppm)concentrations of crude oils or crude oil components to copepods, amphipods, and decapods (Ott, et al., 1978; Wells and Sprague, 1976; Hollister, et al., 1980). Lower growth rates have been observed in Acartia hudsomica exposed to Venezuelan crude (Hebert and Poulet, 1980) and short exposure of Eurytemora affinis and Nitocra affinis to water soluble fraction (WSF) of fuel oil (10 min. to 3 hr. at 3 ppm) resulted in reduced numbers of eggs per female, smaller brood size, and shorter life span (Berdugo, et al., 1977). Shrimp appear especially sensitive to hydrocarbons.

Sanborn and Malins (1977) found Stage IV larvae of Pandalus platyceros were killed by 8-12 ppb naphthalene in 1-1.5 days. Crab larvae have been extensively investigated in recent years and appear to be as sensitive as shrimp larvae (Sanborn and Malins, 1977). Development and growth in Cancer irroratus larvae were delayed upon exposure to No. 2 fuel oil at 0.05 to 0.19 ppm (John and Pechenik, 1980).

Two studies of hydrocarbon effects in echinoderm larvae have shown reproductive and growth effects. Respiration of sand dollar sperm was sensitive to WSF of No. 2 fuel oil (Nicol, et al., 1977) and embryos developed abnormally.
The teleost component of the neuston (fish component of zooplankton) is of obvious concern in considering effects of crude oil on marine ecosystems. A rather small number of species have been the focus of research attention (herring, Clupea; code, Gadus; flounders and killifish; striped bass; morine; and freshwater salmonids). Concentrations of hydrocarbons eliciting both lethal and a variety of sublethal responses have been generally less than 10 ppm for eggs and larvae (Linden, 1978; Kuhnhold, et al., 1978; Linden, et al., 1980; Struhsaker, 1977; Vuorinen and Axell, 1980; Smith and Cameron, 1979).

Experiments funded by the Minerals Management Service Pacific OCS Region exposed eggs and larvae of the northern anchovy, Engraulis mordox, to WSF of Santa Barbara crude oil for 14 days. Statistically significant reductions in growth among control and experimental larvae were observed at 7 days (and subsequently at 14 days) at concentrations as low as 5 ppb added hydrocarbon. Hatching success was also significantly reduced at 50 and 500 ppb WSF but not at 5 ppb. The major developmental abnormality observed in the larvae was a malformed upper jaw with associated reductions in cranial bone formation and pectoral fin development. These results have obvious implications regarding the survival of larval and juvenile fish due to interference in efficient/successful feeding.

Several controlled ecosystem experiments and observations of phytoplankton and zooplankton in real oil spill investigations have occurred in the recent past. These have led to a better understanding of the consequences of crude oil in these portions of the ecosystems although it cannot be claimed that our knowledge is complete at this time. The CEPEX (Controlled Ecosystem Pollution Experiments) and MERL (Marine Ecosystems Research Laboratory) systems were designed and run to simulate spill and chronic oil pollution events. The CEPEX studies involved No. 2 fuel oil, naphthalenes, and Prudhoe Bay crude oil. The most direct effect of oil on zooplankton communities occurred during the second year when microflagellates became dominant in the experimental containers but not in the control chambers (Lee, et al., 1978). The MERL experiments demonstrated changes in respiration and excretion rates in the copepod Acartia clausi and A. tonsa and depression of total zooplankton abundance (Vargo, 1981).

Two extensive studies of zooplankton response to spilled oil were ARGO MERCHANT (1976) and AMOCO CADIZ spills. Oil was found adhering to the cuticle and appendages of plankton and oil particles were found in the guts and fecal pellets of copepod plankton (Mackie, et al., 1978; Maurer, 1976). Plankton diversity was reduced along the French coast from the AMOCO CADIZ spill (Spooner, 1978) while dead fish eggs and malformed fish embryos were observed in the ARGO MERCHANT spill off Massachusetts (Longwell, 1978).

The general conclusions from these two spills and others studies over the last decade is that the response of zooplankton is short-term where detected and that there are seldom any significant prolonged changes in either biomass or standing stocks of individual zooplanktons in open water near spills.

Effects on Macrofauna. The focus of the attention of research on the effects of crude oil or crude oil components on marine macrofauna has turned in recent years away from concentration on short-term acute bioassays and gross overall individual organism effects. Focus instead is towards understanding effects in ecosystems and the specific routes into and out of organisms. This turn towards trying to understand more basic mechanisms has also focused research on the habitats most likely to have any measurable effects, the sediments. The investigations of Addy, et al., (1978) in the North Sea have shown changes in benthic fauna strongly correlated with levels of hydrocarbons in the sediments. Benthic fauna in the MERL experiments exposed to 109 ppm oil in the upper 2 cm of sediments decreased drastically in numbers. Smaller infauna such as harpacticord copepods, osteacods, and numatodes also decreased (Grassle, et al., 1981). Sublethal effects of oiled sediments have been demonstrated. Roesijadi and Anderson (1979) found that Macoma inquinata exhibited reduced condition index and levels of free amino acids when exposed to sediments with 1,200 ppm oil. Similar experiments with the polychacte Abarenicola pacifica have shown reduced feeding and glycogen level at 500 and 1,000 ppm oil in sediments (Augenfeld, et al., 1982). Vanderhorst, et al., (1981) has carried out a 3-year study of experimentally oiled sediment trays in the Strait of Juan de Fuca. He found significant biological effects in recovery rates for the clam Protothaca staminea due to oil. Recovery also depended on substrate type with full recovery of a commercial clam bed oil with 2,500 ppm at 46 months (both predicted).

Fish. Effects of spilled hydrocarbons on fish populations are difficult if not impossible to demonstrate in the ocean. A number of laboratory investigations have examined effects of oil on the more sensitive egg and larval stages of several species of fish (see discussion above). However, as Teal points out, if an oil spill were to severely damage an otherwise successful year class, it would simply fail to appear in the fishing and no one would know or even be able to make a good guess as to whether there was a connection between the spill and failure of the year class or whether this was simply another poor recruitment year (Teal, 1981, personal communication).

The toxicity of oils to fish were discussed in the FEIS for OCS Lease Sale No. 68. The study funded by the MMS for the last 2 years has shown lethal toxicity values of between 50 and 500 ppb of WSF Santa Barbara crude oil to the California halibut and northern anchovy in exposures lasting 120 days. Fish are able to metabolize aromatic hydrocarbons (the most toxic fraction);

however, studies by Malins and Varanasi (Varanasi and Malins, 1977; Varanasi, et al., 1981) have shown that metabolites of aromatic hydrocarbons may be more toxic to cellular DNA than the parent hydrocarbons and may persist for much longer in fish than the parent hydrocarbons. The main site of metabolism in fish (and vertebrates in general) is the liver with subsequent secretion of aromatic hydrocarbons and their metabolities (mainly phenols, quinones, dihydrodiols, and other oxygenated derivatives of the parent aromatic) into the bile. Other pathways of excretion are the skin and gill membranes (Varanasi, et al., 1978; Thomas and Rice, 1981).

Mammals. The amount of research on the effects of oil on marine mammals remains sparse. Absorption of hydrocarbons by seals immersed in oiled water has been demonstrated (Englehardt, et al., 1977; Geraci and St. Aubin, 1981). As in fish, the study results to date show the liver to be the main site of hydrocarbon metabolism and metabolites may be more toxic than the parent compounds. The effects of external coating of marine mammals has been investigated by Warner (1969), Smith and Geraci (1976), La Boeuf (1971), and Geraci and Smith (1977). The results of these experimental oiling and observations has shown little correlation with death in cetaceans. Recent results of the MMS funded research into the ability of marine mammals to detect oil (Geraci, unpublished) has indicated that trained dolphins are able to detect surface slicks of oil under experimental conditions. This may or may not have importance in allowing mammals to avoid oil spills.

The effect of external coating of oil on thermo-regulatory abilities in marine mammals has been studies by Kooyman, et al., (1977), Costa and Kooyman (1980), and Oritsland, et al., (1981).

The object of these studies have been sea otters and polar bears, those mammals in which the pelt rather than blubber plays the dominant thermoregulatory role. The results show that thermal conductance from the body surface increased significantly. The metabolic rates of the polar bears increased significantly from basal levels as did the sea otters. Compensating metabolic increases cannot be maintained indefinitely so that these increases in thermal conductance may result in death.

Birds. The obvious effects of external oiling of sea birds was discussed in the FEIS for OCS Lease Sale No. 68 and the result of oiling of birds is to some degree dependent on the amount and type of oil and the response of the bird (Birkhead, et al., 1973).

Results of laboratory studies of sublethal effects of ingested oil have shown a variety of physiological and reproductive effects. Miller, et al., (1978) claimed reduced growth rate in young herring gulls and black guillemot while Gorman and Sims (1978) failed to find growth retardation in herring gulls. Grau, et al., (1977) showed reduction in egg production in the Japanese quail with exposure to No. 2 fuel oil. Small amounts of oil applied to eggs have been shown to kill the developing embryo inside (Albers, 1978; Coon, et al., 1979; White, et al., 1979).

Extrapolation from laboratory studies of sublethal or lethal effects on birds to effects of crude oil spills on seabird populations is extremely difficult and any conclusions tenuous at best. Variations in reproductive success are influenced by weather, food supply, predation, etc. and these can easily mask variations induced by hydrocarbons. Furthermore, population dynamics of species of concern may differ from the species tested in the laboratory.

5. Manmade Structures: Manmade structures are discussed in detail in the Final Environmental Impact Statements for OCS Lease Sale Nos. 48, 53 and 68 (BLM, 1979, 1980 and 1981, respectively), in the Oil and Gas Transportation Scenarios for Proposed Sale No. 73 (Yamasaki, 1983), and below:

a. Onshore Manmade Structures: For the proposed sale, onshore manmade structures refer to shore and land facilities or structures that would be needed to support the proposed hydrocarbon activities. There would be a need for the following types of onshore structures or facilities, according to Transportation Scenario No.1 (Yamasaki, 1983) (Also see Section IV.E.3.n):

(1) Oil and gas treating facilities;
(2) Crude oil storage tanks;
(3) Supply and crew boat bases;
(4) Onshore hydrocarbon pipelines;
(5) Temporary support bases for onshore and offshore pipeline
(6) Airports (existing) for helicopter support activities.

Direct, impact-producing agents resulting from these onshore manmade structures include space-use conflicts, air emissions, and temporary beach disturbance. Refer to Section IV.E for specific discussions on impacts to a resource.

b. Offshore Manmade Structures: Significant impact-producing agents related to manmade structures include the following:

(1) Oil and gas exploratory, installation, and/or construction activities (all short-term presence).
(2) Presence of offshore structures: Platforms, pipelines, SALMs and Marine Terminals (all long-term presence).

Exploratory Activity-Short-Term Presence

Exploratory operations usually involve the use of a ship-shaped drilling rig, support vessels (crew, supply, or tug boats), and helicopters. These operations are typically short-term, lasting approximately four months per well, per site. Exploratory vessels could remain in the same vicinity for longer than if four months when delineation wells are killed.

Generally, three types of drilling rigs are used for exploratory operations: semi-submersible rigs, drillships, and jack-up rigs. The Diamond M General is typical of the semi-submersible drilling units used in the Pacific OCS region. This unit is a self-propelled 290-foot (90 m) drilling rig. The primary equipment on the rig includes eight 30,000 lb. (13,600 kg) anchors, two 50-ton cranes, and a 160-ft. (49 m) derrick. Propulsion for the vessel is furnished by twin propellers, each driven by six 850 hp electric motors.

The Glomar Pacific is typical of the drillships used in the Pacific OCS region. The Pacific is a self-propelled 452-foot (140 m) drillship. The vessel is moored with an eight point wire line system using eight 30,000 lb (13,600 kg) anchors, or it can be dynamically positioned with thrusters. Each anchor is marked by a welded steel cylindrical anchor buoy, 10.5 ft. length x 8 ft. diameter. A 142 ft. derrick is situated in the center of the vessel with two nearby working cranes.

The Rio Colorado I is a typical jack-up rig. The rig is 200 ft. long and it is towed onto the drilling site by tug boats. The legs are jacked down to the ocean bottom. The rig remains floating until the legs attain proper placement on the bottom and the rig deck is elevated about 30 ft. above the water level. The primary power on board the rig is furnished by five diesel generator sets.

Direct, impact-producing agents of exploratory operations are as follows:

(1) Vessel anchorage;
(2) Drilling process;
(3) Vessel presence; and
(4) Discharges.

These impact agents are discussed below. Refer to Section IV.E for specific discussions on impacts to a resource.

Vessel anchorage would impact the organisms inhabiting the ocean bottom, particularly in rocky and mud-clay bottom areas. As anchors are lowered onto the substrate, epifauna, epiflora, and infauna would be crushed, either by the anchor itself or by the anchor chains. When the anchors are removed, they are sometimes dragged toward the drillship, crushing organisms along the way. However, the standard method of retrieval is for work or tug boats to pick up the anchors and carry them back to the drill vessel. Anchors have also caused mud mounds, trenches, or scars. Anchors could also impact cultural resources such as historic shipwrecks or aboriginal sites.

The drilling process itself is a direct, impact-producing agent. A typical well is begun with the drilling or jetting with seawater of a surface hold (usually 30-36 in diameter) to a depth of 100-350 ft. The materials (drill cuttings) that result from this first several hundred feet are directly discharged to the ocean bottom. Subsequent cuttings are returned to the drill vessel and discharged from there. Surface casing is then cemented to the bottom surface. Progressive sections of the hole are drilled with progressively smaller drill bits. Thus, the actual volume of cuttings that are discharged steadily decreases with increasing well depth. Other discharges to the water column and bottom include drill muds and formation water. Discharges to the water column and bottom are discussed in detail in Section IV.A.8.a of this document. Discharges to the air result from the mechanical operation (diesel engines) of the drilling process. These discharges include SO_x, NO_x, and particulates. Discharges to the air are discussed in detail in Section IV.A.8.c of this document.

Another direct, impact-producing agent of exploratory operations is the presence of the drill rig itself. Vessel presence may result in any of the following effects:

(1) Navigational hazards;
(2) Spatial preclusion of fishing activity; and
(3) Viewshed disruption

It should be pointed out here that the potential for this impact-producing agent to occur is only temporary in nature (generally duration is less than 4 months, however, when delineation wells are drilled the activity would be extended within the vicinity), since we are only considering exploratory operations at this point.

Vessel presence could result in navigational hazards to other vessels under certain adverse conditions. These adverse conditions include periods of high sea state and periods of reduced visibility (e.g., during fog, rain, etc.). Exploratory operators must comply with applicable MMS operating orders and all USCG safety, navigation, and notification requirements.

Fishing space will be temporarily displaced at any site occupied by a drilling rig (see discussion of impacts in Section IV.E.3.e). Generally, the spatial reduction of fishing is dependent upon the water depth of the wells and is about twice the area taken by the drilling rig or is within the boundary of the anchor scope radius. Thus, one typical rig, drilling in water could preclude fishing from an area of up to 1.2 km^2.

Vessel presence could result in temporary viewshed degradation.

<u>Development Activity - Platform, and Subsea Pipeline Installation Operations - Short-term Presence</u>

<u>Platforms</u>. Platform installation operations usually involve the use of barges, crew boats, supply boats, tug boats, helicopters, and the platform itself. These operations are typically short-term, lasting less than 6 months per platform. Platforms are generally fabricated at onshore platform fabrication yards and transported to the offshore site by barge for erection. Platform jackets are launched from a launch barge and lowered to the ocean bottom by controlled flooding. Steel pilings are driven to the desired depth through the jacket legs. The platform is leveled, grouted, and welded in place to each of the piles. Platform raising generally requires a few weeks and the total site installation time is approximately 6 months.

Direct, impact-producing agents that are associated with platform installation operations are:

(1) Vessel anchorage; and
(2) Vessel presence.

These impact-producing agents are similar to those associated with exploratory operations. Refer to Section IV.E for specific discussions on impacts to a resource.

<u>Subsea Pipeline Installation-Short-term Activity</u>

Installation activities usually involve the use of an installation barge and support vessels (crew, supply, or tug boats). These operations are short-term and usually last less than ten days. (This would vary, depending on the length of pipeline to be installed and weather conditions.)

A number of different methods are presently available to install offshore pipelines. Pipelines are initially prepared for installation either at an offshore pipeline lay-site on a pipeline lay barge, or at an onshore facility, then towed to the lay-site by a reel barge, surface tow or bottom tow method.

Direct, impact-producing agents that are associated with subsea pipeline installation operations are:

(1) Vessel anchorage;
(2) Vessel presence;
(3) Pipeline burial operations;
(4) Explosion of rocky areas; and
(5) Abandoned buoys.

These impact agents are discussed below. Refer to Section IV.E for specific discussions on impacts to a resource.

The potential impacts from vessel anchorage and vessel presence are similar to those associated with exploratory operations (see Section IV.E. for impact discussions). A major difference is as follows: Exploratory operations take place at a stationary location (i.e., the well-site). The installation activities of subsea pipelines take place over a much greater distance (i.e., the pipeline route). Thus, the potential impacts from vessel anchorage (i.e., anchor scars) or vessel presence would be distributed over a much greater area.

Long-Term Presence of Offshore Structures - Platforms, Pipelines, SALMs, Subsea Wellheads

The previous section concentrated on short-term activities: exploratory, installation, and/or construction operations. This section will deal with the long-term hydrocarbon activities (i.e., lasting for periods of 20 to 40 years). These long-term activities are the actual presence of structures and their associated discharges and emissions. Chronic discharges are treated in Section IV.A.8; air emissions in IV.A.8.c. Impacts to the offshore structures could result in an oil spill. Once installed, offshore platforms become a quasi-permanent feature of the OCS area. This long-term presence can potentially lead to various hazards and aids as presented and discussed below. Refer to Section IV.E for specific discussions on impacts to a resource.

(1) Navigational hazards;
(2) Viewshed disruption;
(3) Spatial disruption (e.g., pre-emption of fishing space);
(4) Navigation aids; and
(5) Artificial habitat for marine organisms (fishes, invertebrates, and seaweeds).

Platform presence could result in navigational hazards to other vessels under certain adverse weather conditions (see Section IV.E.3.e). These adverse conditions include periods of high sea state and periods of reduced visibility (e.g., during fog, rain, etc.).

Platform presence also produces a long-term degradation of the viewshed (see Section IV.E.3.i).

Fishing space will be displaced at any site occupied by a platform (see Section IV.E.3.e). This space would not be available for fishing.

Platforms could serve as an aid to navigation due to their long-term presence. Usually the platforms appear on Coast Guard charts and serve as a good reference point for ship captains, barge operators, or boating enthusiasts.

The long-term presence of a platform in the water column serves as an excellent artificial habitat for marine organisms. Invertebrates and macrophytes (seaweeds) will settle onto this new substrate, rapidly following the platform's installation. These organisms develop quickly and serve as an attractive food source for offshore fish populations. A more in-depth discussion of artificial habitats is given in Section III.C.5 of this document.

The long-term presence of a subsea pipeline on the ocean bottom could cause conflicts with commercial fishing operations (Section IV.E.3.e).

SALMs occupy only a small space on the ocean bottom and surface. However, with a tanker tied to a SALM mooring line, the vessel could swing or rotate in a circular direction around the mooring site. The maximal swing distance for the SALM located at Platform Hondo in the western end of the Santa Barbara Channel, is estimated at about 600 m (1,829 ft).

6. Vessel Traffic

a. Oil Tankers: These vessels range in size from the general purpose tankers (up to 25,000 to 150,000 DWT), to the Ultra Large Crude Carriers (300,000 to over 500,000 DWT). Dead Weight Tons are defined as the total weight of a tanker when it is immersed to the authorized load depth. According to Transportation Scenario No. 1 (Yamasaki, 1983) two sizes of tankers would be used to transport Proposed Sale No. 73 crude: 27,000 and 45,000 DWT. A 27,000 DWT tanker has a storage capacity of about 200,000 bbls of oil, while a 45,000 DWT tanker can hold about 335,000 bbls of oil. (storage capacity depends on the density of the tranported oil). A typical 16,500 DWT tanker is 532 ft in length, with a draft (depth a vessel is immersed in water when afloat) of 31 ft and a beam (extreme width of the vessel) of 70 ft. A typical 100,000 DWT tanker is 861 ft long, with a draft of 50 ft and a beam of 125 ft.

Direct, impact-producing agents that are associated with tankers include additional vessel traffic, accidents, tanker operations, air emissions and oil spills (either from normal operations or catastrophic events) (See Section IV.E). The principal causes of most vessel accidents are (Marks, 1982) groundings, collisions, and breakdowns.

The smaller sized tankers (6-35 M DWT) and the medium-sized tankers (35-160 M

DWT) exhibit the highest casualties per 100 tankers at risk on a worldwide basis. Tanker accidents can lead to massive oil spills. Oil spills from tankers may also occur during tankering operations. According to the National Academy of Sciences (1975), most of the one million tons of oil per year that does go into the ocean from tank cleaning operations is due to ships not using certain procedures.

b. Supply and Crew Boats: Supply and crew boats are used to service offshore hydrocarbon activities. Supply boats are typically used to transport drilling equipment, cement, drill muds, oil contaminated mud, cuttings or formation water, food, and other supplies to and from the platform, or drillsite. Supply boats require harbor or port facilities such as docks, berthing space, and staging areas (for the storage and loading of equipment and supplies). Crew boats are most typically employed to transport drilling personnel and some equipment to and from the platform or drill-site. Unlike supply boat requirements, crew boats only require docking and berthing facilities at harbors or ports. During periods of adverse sea conditions, helicopters are used to transport drilling personnel.

Direct impact-producing agents that are associated with supply and crew boats follow. These are explained below.

(1) additional marine traffic
(2) support facility requirements
(3) crew and supply boat engines (air emissions)

Impacts associated with additional marine traffic are the increased possibility of vessel-vessel and vessel-structure incidents. These incidents could lead to oil spills, loss of lives, and loss of equipment.

Impacts that are associated with support facility requirements include space-use conflicts between the oil industry and other industries (e.g., commercial fishing, lumber, etc.) (See Sections IV.E.3.e,d,and k).

Impacts that are associated with crew and supply boat engines are air emissions (fumes, exhaust, etc.) which could potentially degrade the ambient air quality (See Section IV.E.1.c).

c. Seismic Survey Operations: Seismic operations are used to determine the presence of hydrocarbons under the ocean bottom. Seismic operations work on the principles of sound reflection and refraction. Reflection involves sound that is reflected, or echoed, from a rock layer. Refraction uses sound that travels along a rock layer for some distance and returns to the surface. Reflection is the most commonly used method today. Reflection exploration is conducted by artifically producing a sound at or near the ocean bottom, and then recording the echoes from the subsurface structures. Generally, a seismic boat (or geophysical) boat is used to carry out the exploratory activities. The boat is usually about 150 to 200 or more feet long.

The seismic source used most often in offshore operations is the air gun. It consists of a chamber that is filled with compressed air, which is suddenly released. The pop of the released air is the seismic impulse. From four to twelve air guns are towed behind the boat at a depth of about 30 feet, with hoses extending from them to air compressors on deck. Air is pumped into the guns, the air is released, resulting in a "pop." The pops occur at about 10 second intervals, for the length of a line. Lines are up to 2-3 miles long. Another method of seismic surveying is to use a marine gas gun. Gas guns fire a mixture a propane and oxygen, or oxygen-enriched air. An array of gas guns are trailed behind or alongside the boat, in a similar way that air guns are towed.

Several other seismic energy sources are used in offshore surveying operations. These sources include steam and explosive charges. Explosive charges are no longer used in seismic survey operations.

Direct, impact-producing agents that are associated with seismic operations follow. These are explained below.

(1) Subsurface impulses
(2) Presence of vessel and associated trailing gear

Impacts from subsurface impulses include physical disturbance of the water column or ocean bottom, and noise production. Pops from air guns could disturb nearby fish or plankton populations. Noise production from the seismic discharges could affect nearby marine mammal populations: either by disturbing their migratory path or actual physical disturbance of the animals.

Possible impacts (see Section IV.E.2.c and e) from vessel presence and trailing gear (up to 2-3 miles long) presence include spatial preclusion of commercial or recreational fishing, disruption of crab or lobster pots and navigational hazards.

7. Noise and Other Disturbances: Noise emissions resulting from OCS development are associated with the operation of offshore platforms, drilling rigs, seismic geophysical surveying, petroleum transfer facilities, onshore processing plants, pump stations, helicopters, and boats. In addition, construction equipment used during the installation of the various facilities emit various amounts of noise. The degree of noise impact depends upon the emitted sound level and the proximity of the source to schools, hospitals, residences, and recreation areas. The precise location of the various facilities is not known at this time. Thus, site-specific noise impacts cannot be evaluated here; however, they will be considered in a future EIS when development plans are known.

Machinery noise sources found on drilling and production platforms are, generally, similar to those used for shore-based operations. Special noise attenuation devices are sometimes used offshore to protect workers in their living quarters located on the platforms. Compressors and diesel engines are usually the loudest equipment on a typical platform emitting about 90 dBA* at a distance of 15 m (50 ft). By comparison, a diesel truck under full load

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*dBA is defined as the A-weighted decibel level. It is a weight average of sound levels also emits about 90 dBA at 15 m. Although other sounds, such as banging of pipes and use of explosives may be more intense, they are of extremely short duration. The possible impact of Proposed Sale No. 73-related noise emissions on the biological environment is discussed in subsequent sections.

In a quiet sea with light wind conditions, normal offshore platform operations would be inaudible beyond about 2 miles (assuming ambient background noise level of 40 dBA and attenuation due to sound wave spreading only). In rough seas and weather conditions, the offshore facility would be inaudible beyond about 1/8 of a mile (assuming 70 dBA background). No onshore noise impact from normal operation of OCS platforms are expected since even under low background noise conditions they would not be audible from shore. Onshore noise levels could be slightly increased by Proposed Sale No. 73-related vessel, vehicle and helicopter traffic; however, these increases are generally expected to be small. Gales (1981) points out that in light seas the sub-sea surface noise propagated by a platform could be detected up to 100 miles away.

Most of the onshore processing and support facilities would necessarily be located in industrially zoned areas where noise would have a minimal impact. If adverse noise impacts could result, mitigation measures such as sound barriers (i.e., earthen berms, block walls, etc.) and mufflers could be utilized. The site-specific noise impact of these developments will be considered in a future environmental document when detailed development plans are known.

8. Effluents and Discharges

a. Water: The development and operation of offshore oil and gas producing facilities will cause the discharge of materials that may have an impact on the natural environment. Material that is discharged would result from two types of activities: 1) normal or routine activities and 2) episodic or occasional emission events (e.g., oil spill) resulting from equipment failure, poor operation techniques, or a variety of events. Drill cuttings, drilling muds, formation waters, and sewage are the types of materials expected to be discharged. The discharge of effluents from OCS activities are under the jurisdiction of the EPA through the National Pollution Discharge Elimination System permits.

Drill Cuttings and Muds. Once drilling starts, drill cuttings and muds may be discharged by dumping into the ocean or they may be barged to onshore disposal sites. Daily discharges of cuttings vary but may range from 0 to 1,700 barrels per day for a single exploratory rig.

The total amount of cuttings and drilling muds estimated to result from this sale is given in Table IV.A.8.a-1. These figures are liberal in that drilling muds are frequently used to drill several wells from the same platform. In the case of costly muds, the material may be transported to other platforms for use in drilling production wells (Dames and Moore, 1980, comments on DEIS for Sale No. 53).

Drill cuttings are composed of rock fragments and liquids contained in the geological formation through which the drilling bit is traveling. To remove

TABLE IV.A.8.a-1

PREDICTED VOLUMES OF EFFLUENTS AND DISCHARGES
FROM PROPOSED SALE NO. 73

No. Platforms	Drill Cuttings (BBLs)	Cu. Yds. Sediment Pipeline Burial	Muds to be Dumped (BBLs)	Formation Water (MBBLs)	Sewage Gal/Day
5	348,480	499,379	499,051	112,464	19,000

the drill cuttings, drilling mud (fluid) from the mud system (mud tanks) is circulated down the hole (well) through the drill pipe. Drilling mud is passed out through the drilling bit nozzle, picking up drill cuttings, and returns to the surface between the drill pipe and walls of the bore hold and/or casing. At the surface, drill cuttings are physically separated from the mud by screening and washing techniques. After the drill cuttings and drilling mud are separated, the drill cuttings are discharged to the ocean and the mud is returned to the mud tank for recirculation down the hold. Drilling mud that adheres to the drill cuttings is discharged to the ocean. Additionally, mud is discharged to the ocean when excess mud is generated by:

(1) Adding solids or water to adjust the mud properties
(2) Changing mud types
(3) Dumping at the conclusion of drilling unless mud can be used in a subsequent well (Sheen Technical Subcommittee, 1976)

Removal of drilled cuttings from the hole is only one function of drilling mud. To obtain satisfactory results in the completion of any well, drilling muds have a variety of functions: controlling subsurface pressures, cooling and lubricating the bit and drill pipe, preventing the walls from caving, preventing clogging of the formation penetrated.

The diversity of drilling hole characteristics coupled with the variety of purposes for which drilling mud is employed ensures that there is no "typical" mud. The ranges in weights of materials composing drilling mud are given in Table IV.A.8.a-2 for muds tested under the EPA guidelines. The concentration of trace metals in whole muds (not used or diluted) are given in Table IV.A.8.a-3 for the EPA muds. Although the mud programs for the central and northern California offshore area may be similar to those mud programs currently used in Southern California; the specific mud programs for central and northern California cannot be listed until drilling is initiated in that area.

Concentrations of metals in muds exceeding the values listed for the tested muds in Table IV.A.8.a-2 have been found in some instances. Barium, 642,000 ppm (Ayers et al, 1980); arsenic, 23.6 ppm (Crippen and Hood, 1980); mercury, 13 ppm (Crippen and Hood, 1980); lead, 820 ppm (Crippen and Hood, 1980); zinc, 1,950 ppm (Crippen and Hood, 1980). It seems evident that the mud analyzed by Crippen and Hood, as used in their artic study, was not typical of other muds.

Discharges of drilling mud must comply with requirements found under OCS Order No. 7 and the National Pollutant Discharge Elimination System (NPDES) permitting procedures. Both of these requirements restrict the discharge of any drilling mud containing oil. The U.S. Minerals Management Service Orders states, "if any oil base mud is used, the mud would not be released to the ocean, and cuttings would be cleaned or barged to shore for disposal."

Discharge of Formation Water. Formation water is recovered along with oil during petroleum production. Formation water is derived from water that was laid down within the sediments in the geological past. During the compaction, some of this interstitial water (connate water) was displaced from the resulting formation to form formation water. Consequently, formation waters reflect their environment of deposition.

TABLE IV.A.8.a-2

COMPOSITION OF TESTED GENERIC MUDS

Component	Range (pounds per barrel)
Barite	0 to 700
Attapulgite or Bentonite Clay	10 to 50
Lignosulfonate (Chrome and Ferrochrome)	2 to 20
Lignite	1 to 10
Drill Solids (Walnut shells, leather)	20 to 100
Sodium Hydroxice	
Soda Ash/Sodium Bicarbonate	0 to 2
Cellulose Polymer	0 to 5
Lime (CaOH)	0 to 20
Sodium Chloride	10 to 125

TABLE IV.A.8.a-3

METALS COMPOSITION ON DRILLING MUDS
TESTED BY EPA PROGRAM

Metal	Concentration (ppm-whole mud)
Arsenic	1 to 3
Barium	2,800 to 141,000
Cadmium	1
Chromium	2 to 536
Copper	2 to 26
Lead	1 to 24
Mercury	<1
Nickel	1 to 8
Vanadium	6 to 35
Zinc	12 to 181

After separating oil from formation water, the formation water may be disposed of by injecting into disposal wells (wells drilled for the purpose of storing formation water), reinjected into producing formations, discharged into the marine environment, or a combination of these three disposal methods. Traditionally, Southern California OCS formation waters have been discharged into the marine environment.

During initial oil production, formation water volumes will represent a small fraction (less than 1 percent) of the total fluid extracted from the well, with oil composing almost the entire amount of fluid. As the reservoir is depleted, the ratio of formation water to oil increases to as much as 3 to 1. Formation water volume estimates are shown in Table IV.A.8.a-1.

Based on a small amount of data, the oil field formation waters of the California coastal region range from 22 ppt to 40 ppt mineral salts. The most common chemical constituents found in formation waters are iron, calcium, magnesium, sodium, bicarbonate, sulphates, and chloride. In addition to these chemical constituents, formation waters contain entrained oil or petroleum hydrocarbons, numerous trace elements, and an absence of dissolved oxygen.

Table IV.A.8.a-4 shows the range in chemical constituent concentration of formation water encountered from wells along the California coast.

Sewage. The estimated annual discharge of sewage from the proposed oil and gas activity is shown in Table IV.A.8.a-1. OCS Order No. 8 states "following sewage treatment, the effluent shall contain 50 ppm, or less, of suspended solids, and shall have a minimum chlorine residual of 1.0 mg/liter after a minimum retention time of 15 minutes". The daily volume of sewage that will be discharged will range from 3,800 gallons/day to 19,000 gallons/day. Sewage discharge was estimated as 100 gallons/day/person on the platforms.

Hydrocarbon Discharges. Hydrocarbons may be discharged into the marine environment as a result of accidental spills. The volume of oil which enters the marine environment will depend on the type of accident and is very difficult to predict. Once the oil enters the ocean a variety of physical and chemical processes act to disperse the oil slick including spreading, evaporation of the more volatile constituents, dissolution into the water column, emulsification of small droplets, agglomeration and sinking, microbial modification, photochemical modification, and biological ingestion and excretion. The rates at which the oil is removed from the ocean will depend on water temperature, current movements which may spread dissolution, wind speed which may aid evaporation and physical mixing by wind waves. A more complete discussion of these factors is found in Malins (1977) and Wolfe (1977).

In addition to the larger spills from accidents, some oil is expected and observed around drilling and production operations. These volumes are probably less than one barrel per day, resulting from small amounts of oil remaining on cuttings, after washing, small amounts spilled when hoses are uncoupled and amounts accidentally discharged from work boats. It should be noted that production platforms are provided with below deck pans and tubing to catch and funnel small amounts of oil which may be related to the drilling equipment for proper disposal onshore. These small amounts of oil are sometimes seen as a

TABLE IV.A.8.a-4

CALIFORNIA OFFSHORE PRODUCED FORMATION WATER
Constituents Range[a]

Formation Water Constituent	Concentration (mg/1)
Salinity (Total dissolved solids)	21,700 - 40,400
Suspended solids/turbidity (Untreated water)	30 - 75
Oxygen Demand	
BOD (5-day)	370 - 1,920
COD	340 - 3,000
Oil and Grease	56 - 359
Trace Contaminants	
Arsenic[a]	0.001 - 0.08
Cadmium	0.02 - 0.18
Total Chromium	0.02 - 0.04
Copper	0.05 - 0.116
Lead	0.0 - 0.28
Mercury	0.0005 - 0.002
Nickel	0.100 - 0.29
Silver	0.03 -
Zinc	0.05 - 3.2
Cyanide	0.0 - 0.004
Phenolic Compounds	0.35 - 2.10

Source: EPA, 1974.

[a] Some data reflect treated waters for reinjection.

NOTE: Due to the limited data from California offshore wells, these values represent estimated constituent values.

sheen on the water near the platform, dissipate within several meters to several hundred meters and are generally considered an insignificant input of hydrocarbons.

b. Effects on Marine Life (Effluents): The effects on marine life of materials other than petroleum hydrocarbons (discussed in Section IV.A.4.c) which are introduced into the ocean are discussed in this section. Resuspended bottom sediments, discharged sewage, drilling fluids (muds and cuttings), and formation water may all have impacts on marine biota. The following discussion will focus on the effects of drilling fluids and formation water because of the much larger volumes involved with these compared to resuspended sediments or sewage. In addition, the effects on marine life from resuspended sediments would primarily be through turbidity or smothering effects and thus the conclusions or research regarding muds and cuttings effects would apply to sediment perturbations.

Drilling mud will be discharged into the ocean as described in Section IV.A.8.a. The fate and effect of mud has been discussed at length in the FEIS for OCS Lease Sale No. 53 (BLM, 1980) and in the Symposium on Research on Environmental Fate and Effects of Drilling Fluids and Cuttings (Courtesy Assoc., 1980), Dames and Moore (1980), Neff (1981), and Petrazullo (1981). In addition to the above reviews, the National Academy of Sciences is conducting a review of available research results and should issue a report in 1983.

Direct impacts of drilling muds and cuttings are via smothering or toxicity of mud components. Some coral species and sea anemone species exist in the Proposed Sale No. 73 area and these may be sensitive to smothering by muds and cuttings. Experiments by Shinn, (1979) indicate short-term (acute) toxicity of approximately 500 ppm for the corals _Montastrea annularis_ and _Agaricia agaricites_. The research indicated corals could survive short-term impacts within 6 m of a mud discharge. However, other research (Hudson and Robbin, 1980; Thompson and Bright, 1980; Krone and Biggs, 1980) showed sublethal effects could be very damaging to corals within an estimated distance of 3 m. It is, therefore, expected that the smothering and/or sublethal impacts to sensitive corals and anemones would be possible in the Proposed Sale No. 73 area. This may apply to hard bottom (rocky outcrops) substrates within the sale area.

The toxicity of drilling mud is debated among groups concerned with OCS impacts. The data to date, although suffering shortcomings in several cases, indicate that muds have low toxicity when compared to petroleum hydrocarbons, trace metals dissolved in sewage, or industrial wastes. This conclusion is based primarily on short-term, 96-hour static bioassays of used drilling muds and drilling mud components. Research has also included a number of sublethal and long-term (106 day) experiments with a range of invetebrates (crustaceans, annelids, mollusks). The sublethal and long-term study data tend to support the conclusion of low toxicity of muds but some data indicate interference with growth in oysters and pectens at concentrations of 100 ppm. Differences in results are probably due in part to differences in muds tested. Whether these latter results are due to toxic or mechanical properties of the muds is open to question. A field study of the effects of mud and cuttings discharge from exploratory wells is expected to start in the near future in

State of California waters in the Santa Barbara Channel. The study will be funded by oil companies operating on leases in State waters as part of the conditions specified in the NPDES permits administered by the State of California. The results of this study should provide data on the effects of muds and cuttings on endemic fauna of the area and subsequently allow comparisons to be made between this study and similar studies in the Georges Bank, Lower Cook Inlet, Mid-Atlantic Shelf, and Gulf of Mexico regions already completed or ongoing.

Formation water will be discharged as described in Section IV.A.8.a and may affect both water quality (Section IV.E.1.a) and marine life (see Section IV.E.2). The number of studies of the effects of formation water on marine organisms is much less than those for drilling muds and cuttings. The primary concern regarding biological effects of formation water center on the trace metal content, hydrocarbon content and oxygen demand of this discharge and the potential for these discharges to add pollutants or reduce oxygen in the ocean. Table IV.A.8.a-4 (Section IV.A.8) lists the characteristics of California formation waters, Table IV.E.1.a-1 and a-2 give the ambient sea concentrations, safe levels, estimated metal concentrations at 1,000-fold dilution, and EPA 24-hr. criteria. The figures concerned with EPA criteria levels of metals represent composites drawn from a large number of tests on a wide variety of organisms (NAS, 1972; U.S. EPA Quality Criteria for Water, 1972). The 96-hour LC_{50} values (the concentration of pollutant at which 50 percent of the test organisms die in 96 hours) for toxicity of different metals varied with the organism tested, the life stage, and the method of applying the toxic substances. The levels indicated in Table IV.E.1.a-2 are conservative and below published levels for acute toxicity.

Acute toxicity of formation water was investigated by Zein-Eldin and Keney (1978) and Rose and Ward (1980). The earlier study reported 96-hr. LC_{50} values for juvenile white shrimp of 1,750-6,500 ppm formation water and a second set of data showing 96-hr. LC_{50} values greater than 100,000 ppm. The first set of values were obtained using formation water treated with two biocides while the second data set was obtained from untreated formation water. The lowest 96-hr. LC_{50} values obtained by Rose and Ward were 7,000-8,000 ppm formation water for larval brown shrimp. This formation water had a high oxygen demand relative to the conditions around the real discharge in the Buccaneer Field. It seems, therefore, that acute toxicity of formation water may be associated principally with removal of oxygen from seawater or indirectly by biocides added to waters prior to discharge.

Mackin (1971) studied the effects of oil field brine discharges (formation water) on benthic communities in Texas estuaries and bays. He found changes in benthic fauna (decreases in diversity and numbers of individuals) at distances out to approximately 400 feet. Beyond this distance the communities were normal.

The long-term sublethal effects of formation water are unknown (beyond the lack of obvious effects in historical producing areas such as the Gulf of Mexico) although the sublethal effects of trace metals on organisms are known for a variety of metals and marine organisms (e.g., Reish, et al., 1976; Oshida, et al., 1981). Galloway, et al., (1980) studying the fouling community on platforms in the Buccaneer Oil Field and the associated reef and demersal fishes found reduced biomass and production levels in the fouling community restricted to one (1) meter vertically and 10 meters horizontally on the platform. Galloway found elevated alkane levels in sheepshead collected near the platforms but less than normal histopathological anomalies (fish were "healthier" near the platforms). Crested blemmies around the platforms showed results similar to the sheepshead; spadefish showed no evidence of petroleum or trace metal contamination attributable to Buccaneer Field operations; and red snapper showed gill hyperplasia in 62 percent of the fish collected. However, more work was needed to understand the population dynamics of the red snapper and the correlation between red snapper gill abnormalities and formation water discharge may or may not be real.

The effects of routine discharges from oil and gas activities on the federal OCS (dumping of drilling fluids and cuttings, discharge of formation water) may be mitigated to a large degree by alternate methods of handling these wastes. Drilling muds and cuttings may be barged to onshore disposal sites (class I sites are required) and formaton waters may be reinjected into the original subsurface formation from whence they came or into wells drilled into the ocean floor specifically for the purpose of storing formation water. The onshore disposal of muds and cuttings, although mitigating impacts to the ocean, creates problems for onshore environmental quality. An adequate site is needed to handle the material and additional barging and trucking traffic to transport the material for disposal is required with concommitant air quality impacts.

Shunting muds and cuttings may be an appropriate mitigation technique where special biological habitats are known to exist. This has been done in the Gulf of Mexico near the corals of the Flower Garden Banks.

Barging the muds and cuttings to form offshore locations in deep water is a possibility but is under the jurisdiction of the EPA dumping regulations. The EPA is also responsible for administering the Clean Water Act and through it establishing any water quality limits to dumping. As in barging onshore to disposal sites, dumping muds and cuttings further offshore has its associated environmental impacts such as impacts to deep water marine organisms.

c. Air: This section describes significant emissions of air pollutants associated with typical OCS activities. Air pollutants discussed include nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), total suspended particulates (TSP), and volatile organic compounds (VOC)*. Ozone (O_3) is not emitted directly by any source, but is formed in a series of complex photochemical reactions in the atmosphere involving VOC and NO_x.

NO_x consists of both nitric oxide (NO) and nitrogen dioxide (NO_2). NO_x is formed from the oxygen and nitrogen in the air during combustion processes, and the rate of formation increases with combustion temperature. NO will slowly oxodize in the atmosphere to form NO_2. NO_x and VOC perform a vital role in the formation of photochemical smog. NO_2 breaks down under the influ-

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* VOC is defined as any hydrocarbon compound, excluding those that are unreactive (such as methane and ethane).

ence of sunlight producing NO and atomic oxygen (O), which then combines with diatomic oxygen (O_2) to form O_3, or with VOC to form various gaseous and particulate compounds that result in the physiological irritation and reduced visibility, typically associated with photochemical smog. Photochemical smog is by far the most serious air pollution problem in many California coastal areas.

CO is formed by incomplete combustion. It is mainly a problem in areas where there is a high concentration of vehicle traffic. High concentrations of CO can have an adverse health effect on humans.

SO_2 is formed in the combustion of fuels containing sulfur. SO_2 in the atmosphere slowly converts to sulfate particles. Sulfates in the presence of fog or clouds may produce sulfuric acid mist. Entrainment of sulfur oxides or sulfate particles into storm clouds may be significant contribution to reduced pH levels in precipitation (acid rain).

TSP emissions associated with combustion consist of small particles (less than 10 microns in diameter). Particulates, especially those in a certain size range of 1 to 3 microns can cause adverse health effects. Particulates in the atmosphere also tend to reduce visibility.

The type and relative amounts of air pollutants generated by offshore operations varies according to phase of activity. There are basically three phases: the exploration phase, development phase, and production phase. For a more detailed discussion of emission sources associated with each phase, refer to POCS Technical Paper No. 83-2 (FSI, 1983a). Significant emission sources are summarized below.

<u>Offshore Emissions</u>

<u>Exploration Phase</u>. Emissions would be produced by 1) diesel-fired power generating equipment needed for drilling exploratory and delineating wells, 2) tug boats, supply boats and crew boats in support of drilling activities, and 3) intermittent operations such as mud degassing and well testing. Pollutants generated would primarily consist of nitrogen oxides (NO_x)*, carbon monoxide (CO), and sulphur dioxide (SO_2).

<u>Development Phase</u>. The primary offshore emission source would be 1) piston-driven engines or turbines used to provide power for drilling, 2) heavy construction equipment used to install platforms and pipelines, 3) tug boats and support vessels. The principal development phase emissions would consist of NO_x with lesser amounts of SO_2, CO and total suspended particulates (TSP).

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* These would consist of nitric oxide (NO) and nitrogen dioxide (NO_2). Most emissions would be in the form of NO. In the atmosphere, NO is gradually transformed into NO_2. Ambient air quality standards are set only for NO_2.

Production Phase. The primary source of offshore emissions would be due to power generation for oil pumping, water injection, and gas compression. The emissions would consist primarily of NO_x with smaller amounts of TSP and CO. Another source of air pollutants would be evaporative losses (VOC) from oil/water separators, pump and compressor seals, valves, and storage tanks. Venting and flaring could be an intermittent source of VOC and SO_2. Gas processing, which involves gasliquid separation, dehydration, and desulfurization would result in emissions of VOC, NO_x, and SO_2. Another source of offshore emissions would be from tanker transit (NO_x and SO_2 from engine exhaust).

Onshore Emissions

Exploration Phase. Onshore emission sources would consist of vehicles transporting personnel and materials, and support vessels operating in the harbors. Pollutants generated in this phase of development would primarily consist of NO_x, CO, and SO_2.

Development Phase. Emissions would consist of 1) crew and supply boats, 2) support vehicles, and 3) construction activities associated with gas processing facilities and pipelines. Emissions would primarily consist of NO_x, CO, TSP and SO_2.

Production Phase. Onshore emission sources would consist of 1) gas processing facilities, 2) tanker activities at unloading site, 3) crude oil storage, 4) pipelines, and 5) refineries.

Emissions from gas processing facilities would be similar to those described under offshore sources. Tanker emissions would primarily consist of exhaust emissions (NO_x and SO_2) from the ship's engines and VOC losses associated with the ship taking on ballast if nonsegregated tanks are not available.

Onshore pipeline facilities would emit minor quantities of pollutants associated with pumps, compressors valves, and related equipment. Pollutants would consist primarily of VOC and NO_x.

Crude oil may be stored in floating roof tanks or in fixed roof tanks equipped with a vapor balance line. Emissions from floating roof tanks would consist of standing losses and withdrawal losses. Standing losses would be from vapor escaping due to pressure differences. Withdrawal losses would be due to evaporation of hydrocarbonds clinging to the tank wall as the floating roof descends. Emissions from tanks equipped with a vapor balance line would be very small.

Emissions would also result from refining the crude oil. It is anticipated that no increase in refinery capacity would be needed in California as a result of the Proposed Lease Sale No. 73. However, crude oil from proposed OCS Lease Sale No. 73 is expected to be higher in sulphur and trace metals than most oil being processed California refineries presently. Refineries processing OCS oil would need to be modified. It is anticipated that no increase in air emissions would result.

Summary of Emissions. Table IV.A.8.c-1 lists the projected emissions associated with Proposed Sale No. 73. Emissions are given for the peak development year and the peak production year. The peak development year would occur in either the year 1988 or 1989. The peak production year would occur between the years 1989 and 1993.

Emissions of NO_x and TSP reach a maximum during the peak development year. The primary emission sources would be crew boats, supply boats, and heavy construction equipment used in the installation of platforms and pipelines. Emissions of VOC, SO_2 and CO reach a maximum during the year of greatest production. The largest contribution to VOC emissions would be from gas processing.

9. Changes in Economic Activity: The California economy in 1982 is expected to follow the national recessionary trend, but with milder impacts. The economic slowdown has affected various sectors of the economy differently.

Employment losses are widespread throughout the economy. Construction employment has been the hardest hit, reflecting the prolonged slump in homebuilding and slowdown in commercial construction activity. Durable goods and retail trade have also shown deep declines in the past year. Agriculture is faced with two main problems: poor economic performance results in a decline in demand, while recent good crops have produced a downturn pressure in prices. Showing resistance to the recession are the finance group, mining, and wholesale trade all of which have shown some increase in employment. Total employment in the State will grow by 1 percent to 10.8 million in 1982. The unemployment rate will average 8.5 percent for the year, from 7.4 percent in 1981, which has been below the national average. Unemployment will peak in the 9.0 percent range before it declines toward the end of the year. Despite higher unemployment, some improvement in the economy is expected in the last two quarters of the year. The factors leading to an upturn in the economy include the downward trend in the rate of inflation, the personal income tax cut scheduled for July 1st, and the growth in defense spending.

Disposable income for most people will rise due to a lower inflation rate of about 8 percent down from 10 percent in 1981. Also, the 10 percent tax reduction in personal income taxes which takes effect on July 1st is expected to have a big impact on disposable income. Gains indisposable income will spur consuming spending, which, in turn, would result in an increase in overall economic activity.

Because of California's specialization in aerospace and electronics, the State normally captures 20 percent of the nation's defense procurement dollars and 30 percent of research and development spending. In fiscal year 1982, defense and R & D authorizations nationwide will total $90 billion over 1981, of which California should receive about $18.5 billion. This increase in defense spending will have a favorable impact on the California economy as employment in these areas will rise.

TABLE IV.A.8.c-1.

ESTIMATED MAXIMUM ANNUAL EMISSIONS
PROPOSED OCS SALE NO. 73

	Emissions (tons/year)				
	VOC	NO_x	SO_x	CO	TSP
Exploratory Phase[1,2] (1985)					
Exploratory Drilling	41.6	319.2	18.0	44.2	19.4
Support Vessels	1.3	60.2	4.1	9.0	2.4
Total	42.9	379.4	22.1	53.2	21.8
Development Phase[3] (1989)					
Development Drilling	8.2	62.5	10.2	36.1	3.7
Platform Installation	14.9	314.7	20.5	54.6	16.8
Pipeline Installation	10.6	172.6	11.6	34.4	11.0
Production Platforms	49.7	191.2	1.4	133.1	10.7
Support Vessels	8.0	366.3	25.0	55.6	16.1
Tankers in Port (Gaviota)	8.6	2.4	3.2	0.5	0.4
Tankers in Port (San Francisco)	5.5	1.1	1.4	0.3	0.2
Tanker Transit	0.6	11.5	52.2	0.6	3.3
Total	106.1	1122.3	125.5	315.2	62.2
Production Phase[5] (1993)					
Production Platforms	147.2	605.2	4.4	422.4	33.8
Support Vessels	4.6	212.2	14.4	32.8	9.4
Tankers in Port (Gaviota)	28.2	7.7	10.5	1.8	1.4
Tankers in Port (San Francisco)	17.7	3.6	4.6	0.8	0.6
Tanker Transit	1.8	37.3	170.4	1.8	10.6
Total	199.5	866.0	204.3	459.6	55.8

1. Calculation made by MMS based on data provided in OCS air quality handbook (FSI, 1983a).

2. Peak exploratory activity in year 1985, assumes 3 exploratory and 4 delineation wells drilled.

3. Peak development activity in year 1989, assumes 49 development wells drilled, 2 platforms installed, 46 miles of pipeline laid, and 4 platforms producing 6,650 BOD and 6,500 MCFD each. Tanker traffic out of Gaviota would consist of 8 roundtrips by 45,000 DWT tankers to Galveston and 13 roundtrips by 27,000 DWT tankers to San Francisco.

4. It is assumed that VOC emissions from tanker loading or unloading activities would be controlled using vapor balance lines, providing a control efficiency of 95 percent.

5. Peak production activity in year 1993, assumes 5 platforms would produce 16,860 BOD and 16,420 MCFD each. Tanker traffic would consist of 24 roundtrips by 45,000 DWT tankers to Galveston and 39 roundtrips by 27,000 DWT tankers to San Francisco.

SOURCE: POCS Technical Paper No. 83-2 (FSI, 1983b)

10. Effects of the Physical Environment on Oil and Gas Operations

a. Geologic Hazards: Geologic hazards are any geologic features or processes, existing or potential, that would inhibit the exploration and development of petroleum resources. Geologic hazards that are recognized on the central-northern California continental margin are a) areas of high incident of seismic activity; b) active faults; c) mass movement of unconsolidated to semi-consolidated sediments; and d) steep slopes (> 10°) and steep-walled submarine channels (Richmond et. al., 1981). These hazards may present many operational limitations to the exploration and development of oil and gas. Therefore, adaptations in the placement, structural engineering, routing of pipelines, exploratory drilling and production platforms may be necessary. Geologic hazards which are hazardous in their present state, but whose effects can be feasibly lessened through existing technology and design pose engineering constraints to oil and gas development. These hazards identified offshore central-northern California are a) filled or shallow-buried channels; b) hydrocarbon seeps, seep mounds and gas craters; c) gas-charged sediments, and d) pressurized shallow gas zones.

A basin analysis of the geologic hazards is presented in Section III.A.1.b. In addition, the data presented on the geologic hazard and the geologic structure visuals represent the compilation of data collected over a period of 12 years. The bulk of the data was collected aboard U.S. Geological Survey research vessels on recent cruises funded by MMS (McCulloch, 1982). These visuals provide a regional scale representation of the geologic hazards, geologic structures, and seismicity for central-northern California.

Seismicity and Faulting. The central-northern California OCS is cut by numerous faults that represent a potential for strong ground motion. Many of these faults are not considered hazardous to hydrocarbon development except where they are considered active. Faults are considered active if recent sediments are offset where sedimentation has been continuous, if they intersect or offset the seafloor, or if they have a historic record of earthquake activity (Richmond and Burdick, 1981). Active faults are hazardous to man-made structures in terms of ground motion, producing seafloor instabilities and ruptures of the seafloor.

Mass Movement. Three types of mass movement of sediments are recognized: slides, stumps and creep. A slide is the descent of a rigid or semi-consolidated mass with little internal movement. A slump is the rotational sliding of sediments. Creep is the very slow and nearly continuous downward gravity-induced movement of sediments.

Gravity is the major contributing force for mass movement of sediments on marine slopes. Unconsolidated sediments are stable with regard to gravity forces where the slope equals the friction angle of the sediments. The occurrence of sediment failure on very gentle slopes - 0.25 degrees (Field, et al., 1982) indicate that external forces contributed to the failure.

Local seismicity can cause sediment failures (Edwards, et al., 1980, and Field, et al., 1982). Earthquakes can cause additional shearing stresses and increase pore-water pressures resulting in the failure. Additional causes of mass movement is overloading, or oversteeping of slopes, high gas content in shallow sediments and storm surges.

Structures sited on the seafloor near major active faults may experience sediment failures.

Steep Slopes/Steep-Walled Canyons. Slopes are arbitrarily classified as flat, gentle, moderate or steep. Flat slopes are defined as the horizontal sea floor. Slopes less than 5 degrees are considered gentle, slopes of 5-10 degrees are moderate, and slopes greater than 10 degrees are steep. Only steep-walled canyons and steep slopes are considered to be hazards, especially those with sediment cover.

Buried Channels. Buried channels are identified by irregular erosional contact between younger and older sediments. The channels were cut during periods of lower sea levels and have been subsequently buried by transgressing seas. The infilling sediments in the channels may show crossbedding or unconformable bedding. Shallow-buried channels are considered to be constraints because the load-bearing capacity may differ between the younger and older sediments. In addition, bearing capacity within the buried channel can vary. Channel fill, if permeable can cause the loss of drilling fluids during drilling operations.

Hydrocarbon Seeps. Hydrocarbon seeps result from the upward migration of oil and gas from deeper reservoirs. Gas seeps in association with bedrock outcrops, steeply dipping beds, and faults are considered constraints to development. The near-surface geologic structures act as conduits from possible pressurized zones at depth. If these structures are intercepted during drilling they can act as possible escape routes for hydrocarbons.

Gas-Charged Sediments. Gas-charged sediments are unconsolidated to semi-consolidated sediments saturated with gas under normal or near-normal pressures. Gas-charged sediments are considered constraints due to large differences in load-bearing capacity which may exist between the gas zone and surrounding sediments. The ability of these sediments to support man-made structures may be significantly reduced. The presence of the gas can also result in liquifaction or cause the sediments to be more susceptible to failures due to seismic ground motion.

Shallow Gas. Shallow gas zones refer to confined gas accumulations with possible abnormal-pore pressure. Shallow gas may be biogenic in origin from the decomposition of organic material. It may also be by gas trapped in sediments after migrating upward from deeper reservoirs.

Subsidence. Withdrawal of fluids from the oil zones, with the consequent lowering of reservoir fluid pressures, may cause reservoir compaction and eventual ground surface subsidence. Although certain geologic conditions can cause subsidence (i.e., a thick, shallow, unconsolidated sand section, high porosities, interbedded fine-grained soils), the principal controlling factor is pore-fluid pressure. Significant reduction in the natural pore-fluid pressure (e.g., from fluid withdrawal) may result in the transfer of load from the pore fluids to the internal structure of the formation, and subsequent compaction of the soils.

OCS Orders and Regulations (30 CFR 250). Exploratory drilling operations, emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas, and the emplacemment of pipelines will not be allowed within the potentially unstable portion of this lease block unless or until the lessee has demonstrated to the Regional Manger (RM) satisfaction that mass movement of sediments is unlikely or that exploratory drilling operations, structures (platforms), casing, wellheads and pipelines can be safely designed to protect the environment in case such mass movement occurs at the proposed location This may necessitate that all exploration for development of oil or gas be performed from locations outside of the area of unstable sediments, either within or outside of this lease block.

If exploratory drilling operations are allowed, site specific surveys shall be conducted to determine the potential for unstable bottom conditions. Also, an extension of these surveys may be required outside of the leased block. If emplacement of structures (platforms) or seafloor wellheads for production or storage of oil or gas is allowed, all such unstable areas must be mapped. The RM may also require soil testing before exploration and production operations are allowed.

The existing regulations require the lessees to conduct site specific surveys prior to any approval of exploration and development actions. Exploration permits require 2000 ft. grid geologic hazard surveys. The hazard surveys provide the MMS geophysicists with information to determine slope, faulting, natural gas seeps, possible high pressure zones, old river channels, and unconsolidated sediments and slope stability. From the report the geophysicists prepares on this information, the MMS engineer will determine if geological conditions are acceptable for exploration operations. If the geological information indicates conditions too severe for exploration, the exploration plan will not be approved or the operators will be required to move their exploration site to an area safe for exploration.

Permits for all platforms require a geological hazard survey similar to the exploration survey, except the survey is done on a more detailed grid. Additionally, MMS requires soil analyses to determine if the soil can support the platform. From the geophysicist's report, the MMS engineer determines if the geologic conditions are suitable for the placement of a platform. If the geological information indicates conditions too severe for platform placement, the platform plan will not be approved or the operators will be required to move their platform placement site to an area safe for platform placement.

Additionally, the platform plans must go through a Platform Verification Program. The Platform Verification Program is a mandatory and integral part of the review and approval process for Plans of Exploration and Plans of Development/Production in addition to addressing platform design, fabrication, and installation. The major thrust of the Program assures that new fixed or bottom-founded oil and gas platforms in frontier areas can function safely in unusual or extreme environmental conditions. In addition to the review by the MMS Platform Verification Program Committee, an independent review is completed by an expert outside the Federal government. Independent third-party experts are evaluated and certified by the USGS on the basis of technical competence and demonstrated experience in offshore engineering. They are then placed on an approved list and selected by the lessee. The technologies involved in implementing the Program entail representation from such diverse disciplines as structural engineering, soil mechanics, geology, geophysics, oceanography, meteorology, hydrodynamics, quality assurance, statistics, and computer science.

In addition to the Platform Verification required under OCS Order No. 8 all the OCS Orders and other regulations under 30 CFR 250 are important in maintaining safe and proper OCS oil and gas operations. OCS Orders 2, 5, 6, 8, and 9 and 30 CFR 250.12 and 30 CFR 250.41 are specifically important in ensuring oil and gas operation on the tracts listed above will be explored and developed in a safe manner.

OCS Order 2 pertains to drilling operations. This order basically specifies the regulation for drilling wells; types of blow out prevention equipment required, type of mud, casing and cement programs required under varying geologic conditions; and training all operators must have for crews.

OCS Order 5 pertains to production safety system. This order requires the use of best available and safest technology (BAST); safety equipment, work done under standards formulated by reputable professional trade organizations and societies (API, ASME, APPE); and the requirement for down hole safety device. The down hole safety device will automatically close in upon failure, thus in case of well rupture the well would shut in, and gas and oil would be stopped from moving to the surface.

OCS Order No. 6 provides procedures for completion of oil and gas wells.

OCS Order No. 8 pertains to platforms, structures and the platform verification program.

OCS Order No. 9 requires that the pipeline systems are designed to withstand conditions the pipeline would be subject to on the sea floor.

30 CFR 250.12 pertains to the USGS Director's authority to suspend production or other operations. The Director has the authority to suspend production or other operations if lessee violates any applicable law, regulation OCS Order, or condition of permit, or if continued operation posses a threat of serious harm to life or the environment.

The lease may be cancelled if the Secretary determined that continued operation would pose serious harm to life or the environment. It may also be cancelled if the threat of harm will not disappear or decrease to an acceptable extent within a reasonable period of time.

30 CFR 250.41 pertains to well control. This regulation requires the lessee to control the well at all times.

The above regulations and OCS orders provide adequate means to mitigate the geologic hazards within the proposed sale area. Attaching geologic hazards stipulations to the leased tracts would not provide any additional mitigation.

Exploration And Production Technologies. Petroleum exploration and production technologies have been developing rapidly. As more and more development takes place, various engineering adaptations to platform structures and pipeline laying, and the proposal of alternatives for platform sites and pipeline routes have been developed.

Petroleum engineers design platforms in accordance with OCS Order No. 8 to withstand dynamic loads caused by severe storm waves, earthquakes, and stress/strain during launching and installation. Particular emphasis is given to design criteria based upon the geologic hazard/constraint and soil stability analysis.

When a platform is in an area of recognized seismicity all structures are required to be designed for an earthquake environment.

Two earthquakes of different levels are generally postulated for seismic design. The lower level Design Earthquake is the earthquake that is reasonably expected to occur during the life of the structure. The Design Earthquake is designated as the 200-year event. The Maximum Credible Earthquake is the maximum earthquake expected to occur. This earthquake is based upon the largest peak ground acceleration.

To determine the Design Earthquake and the Maximum Credible Earthquake for the site, a review of the geology, tectonics and seismic history of the region and the positions of the epicenters of the major earthquakes is performed. Based upon this data, a statistical recurrence relationship is developed for each possible seismic event in the area. This information is used in determining the Design Earthquake. The Maximum Credible Earthquake will be governed by either a fault related event or an event associated with regional tectonics. The worst case fault related event in the area is based upon an epicenter postulated to occur on the fault trace nearest the platform site. These events are then used to determine the peak horizontal ground acceleration for the area.

Design specifications are then based upon ground accelerations so the platform could resist shaking, without damage and withstand ground motion without collapse.

Various conditions, mass movement sediment transport, and faulting can cause bottom instabilities. An interdisciplinary study of the platform site by geologists, seismologists, oceanographers and soil engineers can provide the information needed for design specifications. Information required for the evaluation of the expected soil response consists of regional and site-specific geology of the area, shallow and deep geophysical data, past, present and future environmental conditions, both coring and in situ testing of the soils, and results of analytical models.

The economy and safety of platform design can be improved by the early identification of geologic hazards and constraints. In many instances the relocation of drill sites and platforms can mitigate the potential hazard. The danger of subsidence due to fluid withdrawal is controlled by a pressure maintenance program using water injection. This program is usually begun after the start of production and will continue throughout the life of the field.

Offshore pipelines must be designed to withstand numerous hazards during their lifetime. Design criteria include corrosion, geologic hazards, hydrodynamic forces, and accidental damage caused by anchors and other objects.

Data required to determine design specifications is acquired in a similar fashion as for platforms.

b. Physical Oceanography: The physical oceanographic forces of currents and waves are believed to pose no threat to the physical integrity of drilling rigs or production platforms used offshore. Oil and gas structures have been engineered to withstand the maximum expected currents, which are typically less than 40 cm/sec in the lease sale area, and also the 100-year expected storm waves, which are less than 10 meters in the area. Storms and associated waves may cause cessation of some activities on rigs and platforms because of the danger to personnel transfer from shore boats or the danger and spill hazards involved in off-loading oil from platforms to tankers (if this method of transportation is selected). This is only expected to occur in areas greater than 3 meters (personal communication by Exxon handle platform personnel). Bottom currents are not expected to affect the transportation of oil and gas by pipeline.

c. Meteorology: The Central California coastal waters experience a high frequency of restricted visibilities (see Section III.A.8). This may occasionally restrict certain operations, such as helicopter flights. However, dense fog would seldom be expected to last long enough to cause significant delays in OCS operations.

Strong winds are infrequent, although in winter season, occasional periods of strong winds and high waves may disrupt construction activities or the movement of crew or supply boats. However, these conditions seldom persist for more than one or two days. Thunderstorms generally occur less than a few times a year. Tornadoes or freezing conditions are virtually unknown.

B. Mitigating Measures that are Part of the Proposed Action

1. OCS Operating Orders: OCS Orders are mandatory requirements and specifications for oil and gas exploration and recovery operations that implement the regulations in Title 30 of the Code of Federal Regulations. Orders outline permit requirements, engineering criteria, surveillance, testing procedures, and information requirements. Pacific OCS Orders are administered by MMS and contain requirements which have been designed to help ensure the safety of operations and personnel and to minimize the risk of environmental damage. Conformance with these orders is regularly monitored by MMS personnel. MMS conducts daily inspections (either announced or unannounced) of all exploratory functions and it conducts semi-annual inspections of all platforms in the Pacific OCS region. Pollution surveillance flyovers of platforms, pipeline routes, and exploration operations are made weekly. The staffing size of the inspection program will be proportional to the exploration and development activities. The following is a description of each Pacific OCS Order:

OCS Order No. 1. This order requires identification of the operator, block designation and well number on platforms, structures, wells and mobile drilling units. It requires that the U.S. Coast Guard District Commander determine what aid-to-navigation devices are needed for subsea objects that are hazards to navigation or to the deployment of commercial fishing devices. It requires that equipment of sufficient size or of such a nature that it could be expected to interfere with commercial fishing gear, if dropped overboard, be marked, wherever practicable, with the owner's identification.

OCS Order No. 2. This order details drilling operation rules and permit requirements, including those for mobile drilling units (including fitness and ability to withstand oceanographic and meteorological conditions). It includes criteria relative to inspection of all fixed and mobile drilling units; required hazards report and other surveys as necessary; well design, casing, and cementing; blowout-preventer equipment requirements; mud program; supervision, surveillance and training; criteria operations and curtailment plans; and for the establishment of field drilling rules.

It requires lessees to submit data and information as follows:

(a) A plan for exploration, development/production and an application for permit to drill.

(b) Provide for the inspection of drilling platforms by the designated officer of MMS.

(c) Well site surveys for geologic hazards.

(d) Well casting and cements and mitigation to prevent fresh water zone contamination, the flow of fluids between formations penetrated, and the loss of well control which would release any oil or gas into the environment or which may threaten human health or safety.

(e) Directional surveys to insure that well holes stay within the confines of the lease.

(f) Blowout preventors and relative pressure control equipment to be installed.

(g) The drilling muds to be used.

(h) Provide for proper supervision of the drilling operations at all times to insure compliance with regulations, orders and NTL's.

(i) Compliance with H_2S standards during drilling operations.

(j) Curtailment of operations under MMS established conditions.

(k) Compliance with any additional drilling rules established by MMS.

(l) Departure and abandonment of drilling operations must be provided and approved.

OCS Order No. 3. This order establishes the requirements for the permanent plugging and abandonment procedures for all wells drilled for oil and gas. Requirements for placement and capabilities of cement and mud plugs are also outlined. All casings, wellhead equipment, and pilings must be removed to a depth of at least 5 meters (16 feet) below the ocean floor unless another depth is approved by the MMS.

OCS Order No. 4. This order sets out criteria for demonstrating the capability of a well to produce paying quantities of oil or gas.

OCS Order No. 5. This order contains detailed procedures for the operation of surface production safety systems; subsurface safety devices; additional safety and pollution-control requirements; and crane operations. The Failure and Inventory Reporting System (FIRS) is outlined, as are employee orientation and motivation programs concerning the safety and pollution prevention.

The order requires the use of Best Available and Safest Technology (BAST) and the lessee is encouraged to support continued development and improvement of safety-system technology. Safety and Pollution Prevention Equipment (SPPE) must conform to established quality assurance standards of the ANSI/ASME.

OCS Order No. 6. This order sets specifications and testing procedures for completed wells and for multiple or tubingless completions. It relates to production operations only.

OCS Order No. 7. This order requires that the lessee prevent pollution of the ocean, prescribes certain pollution control measures, outlines requirements for Oil Spill Contingency Plans, and prohibits disposal of any waste materials into the ocean that will create conditions which will adversely affect the public health, life, property, aquatic life, wildlife, recreation, navigation, commercial fishing, or other uses of the ocean. Disposal of waste materials is regulated by the Environmental Protection Agency pursuant to the Federal Water Pollution Control Act, as amended.

The lessee must submit a description of procedures, personnel and equipment to be used in reporting, cleaning and prevention of the spread of any oilspill which might occur during the conduction of exploration or development activities. An Oilspill Contingency Plan must be submitted with or prior to submitting an Exploration Plan or a Development and Production Plan and approved by MMS. The Plan contains identification, inventory and location of applicable equipment, materials and personnel, response procedures depending upon the magnitude of the spill, identification and protection procedures for sensitive biological areas, spill notification process, spill containment and cleanup action plans, and disposal plans for recovered spill material.

Pollution control equipment and materials must be maintained by, or must be available to, each lessee at an offshore location and at an approved onshore location. Use of chemical dispersants or additives for treating oilspills requires MMS approval. The Order also requires rigorous pollution inspection of manned and unmanned facilities at intervals prescribed by the MMS, establishes requirements for pollution reports for all oilspills, and gives procedures for notification of proper authorities.

The Order provides that drills and familiarizing personnel with pollution control equipment and operational procedures be conducted at lease once every twelve months. Immediate corrective action must be taken in all cases when pollution has occurred.

OCS Order No. 8. This order establishes requirements applicable to platform and structure design and installation. It requires consideration of environmental conditions which may contribute to structure damage. This order applies to production operations.

OCS Order No. 9. This order for the Pacific Area OCS provides approval procedures for oil and gas pipelines on the OCS. All pipelines and related equipment must be designed and maintained with high-low pressure sensors, automatic shut-in valves, checkflow valves (to control backflow), and metering systems. The Order also requires adequate provisions for cathodic corrosion protection, trawling compatibility, hydrostatic testing, storm scour and other environmental stress in OCS pipelines. Procedures and schedules for regular inspection of pipelines along with recording of such inspections are stipulated.

OCS Order No. 10. This order provides for drilling twin core holes located adjacent to core holes drilled on the OCS under earlier California State authorization. Such holes were drilled prior to the establishment of Federal authority beyond the 3-mile limit.

OCS Order No. 11. This order sets requirements for maximum efficient recovery rate for oil and gas from a lease, and establishes production rates. It also provides procedures to shut-in wells, due to over-production or storms, and for producibility tests. Gas may not be flared or vented without approval by MMS. Gas may be flared or vented during tests or in emergencies. If the amount of gas is not of sufficient quantities to warrant treatment and processing, it is reinjected into the formation.

OCS Order No. 12. This order sets forth requirements for public inspection of records. It details what information, which the lessee provides to the Minerals Management Service, is considered public and how this information should be transmitted to MMS in order for it to be made publicly available.

2. Oil Spill Cleanup and Containment

a. Capabilities: Minimizing potentially negative impacts to the environment from offshore oil spills has been a prime concern of government and industry for many years now. As a result, stricter environmental regulations have been issued, oil spill cleanup devices have been improved, and research efforts continued for more efficient cleanup techniques.

The regulations addressing cleanup include the U.S. Department of the Interior Pacific OCS Orders governing oil and gas lease operations (January, 1980). Order numbers 2, 5, 7, and 8 specifically address oil spill contingency planning, personnel training requirements, and the maintenance of on-site oil spill containment and recovery equipment. The on-site equipment requirements include 1,500 feet of open-ocean boom with deployment and recovery capabilities. In addition to these operating orders, an implementation document, Commandant Notice No. 5740 between the U.S. Coast Guard (the lead agency with predesignated on-scene coordinators for OCS oil spills) and the U.S. Geological Survey (now partially incorporated into the Minerals Management Service) specifically lists guidelines for contingency planning and cleanup capabilities. This notice has been in effective since June 1, 1982, and is expected to remain in place [see Appendix C]. This notice requires that oil spill recovery equipment be operable in 8-10 foot seas and 20 knot winds and deployable in 5-6 foot seas.

Currently, there is over $15 million invested in cleanup equipment on the West Coast. Most of this equipment is either with the oil industry (largely through the cleanup cooperatives) or the Coast Guard. The large number of cleanup devices available commercially include oil spill booms (both open-ocean and harbor), skimmers, oil/water separators, pumps, sorbents, and chemical dispersants. The current cleanup capabilities (specifications) of the mechanical devices now available are very controversial. The manufacturers report that heavy-duty open-ocean booms (such as the Clean Seas Bottom Tension Boom) are capable of oil containment in 25 knot winds and 4-5 foot seas, in currents up to 1 1/4 knots. Recovery ability through the use of oil/water separators and oil skimmers is as much as 2,000 gallons per minute (GPM) for oil (in water) of grades ranging from light to Bunker C (heavy), in moderate seas (Clean Seas Skimmer System). Efficiency rates of skimming systems can be as much as 100 percent under ideal conditions, (Clean Seas Oil Mop, Inc. MK-II-9). Efficiency rates for containing and recovering spilled oil are greatly reduced in strong current, high winds, and sea states and with high viscosity oils. When sea states and wind conditions start getting high, oil begins to get entrained above and below the oil boom, and skimmer and oil/water separator efficiencies decrease (more and more water is recovered with the oil). However, when the weather is rough, although the cleanup equipment is not as effective or may not be deployable, the natural breakup and dispersion of the oil is greatly enhanced by high energy level in the water column.

Wave period will also affect recovery ability. Long, slow waves will allow for greater recoverability than waves at a higher frequency with a shorter period.

In the case of "high pour point" or very viscous oils spilling, additional efforts would be required during a spill cleanup operation. Although very viscous oils can be corralled by standard oil spill booms, it may be very difficult to recover the boomed oil by standard oil skimming devices. In addition, chemical dispersants are also less effective on high viscosity oils, as the oil/water interface is less accessible to the dispersant, the dispersant having a tendency to "roll-off" the oil. Absorbent materials (pads, straw, chicken feathers) would be necessary to soak up the oil (either within boomed off areas or open waters) and then manual labor efforts (shovels, pitchforks, etc.) would be required to remove the oil soaked sorbents from the environment. The West Coast oil spill cooperatives have this capability (see Appendix D).

When mechanical cleanup is not feasible due to weather conditions or other reasons, chemical dispersants may be applied either from the air or surface ships. Chemical dispersant technology has been advanced significantly in the last few years, reducing toxic chemical effects from the dispersants themselves while increasing dispersant efficiencies (Page, et al, 1983; Gilfillan, et al, 1983; MacKay, et al, 1983). A rigorous approval policy for dispersant use must be followed before application is allowed (Smith and Pavia, 1983; Region IX Oil and Hazardous Substance Pollution Contingency Plan, 1983). A standardized chemical dispersant checklist for deciding appropriateness of usage from the Region IX Oil and Hazardous Substance Pollution Contingency Plan is included in Appendix E.

Although the use of chemical agents to facilitate oil spill cleanups is discouraged, they may be used at the discretion of the on-scene coordinator (OSC) to reduce an immediate threat to life and property. In other instances, a senior EPA official will decide whether it is appropriate to use dispersants after going through the checklist mentioned above and after consultation with the OSC and members of the Regional Response Team - RRT. The RRT is made up of representatives of Federal and State Agencies responsible for responding to and planning courses of action for environmental emergencies, such as oil spills. The EPA maintains a list of pre-approved chemical dispersants that may be considered for use.

As more research is done, the effects of chemical dispersants will be better understood. It appears now that the "last-resort" attitude towards dispersants is beginning to change. The EPA is considering streamlining the approval process, and a new policy statement is expected within the year. A multidisciplinary task force (industry, government, academia) is currently developing ecologically based guidelines for dispersant use, with the intention of minimizing ecological damage from oil spills. Dispersants are being considered on an equal level with other cleanup alternatives, including the "no action" option. A final report is expected within the year.

It appears, at present, that the oil spill cleanup cooperatives with the assistance of the Coast Guard and the on-site oil company equipment are capable of handling the cleanup of most oil spills (less than 1,000 bbls). The chief limiting factor would be weather conditions (rather than equipment) at the time of the spill. Personnel safety is, of course, given top priority during any cleanup operations. Weather conditions found often on the central California coast will prohibit conventional, mechanical, cleanup efforts. In the event of a large spill or a spill during harsh weather, dispersants may be applied, as avoidance of oil contact with shoreline or island areas is the primary concern after personnel safety. This adds significantly to the arsenal of oil spill countermeasures.

Estuaries are areas of special concern because of their importance ecologically and commercially. The very narrow openings of many estuarine systems make it feasible to prevent oil from entering the system by boom containment, diversion, or the various estuary closing techniques. Booms have effectively been used to protect sensitive coastal areas in California (Lindstedt-Siva, 1980). Certain estuaries, such as Morro Bay, may have extreme currents ($\geq$ 5 knots) during certain stages of the tidal cycle, because of the constricted entrances. Booming in an area of currents this strong would be very difficult. Booming strategies may still be feasible with prior planning (Onstad, personal communication, 1983). The strategy may involve deflective booming outside the estuary entrance to not allow oil from entering (as mentioned above), or deflective or containment booming inside the estuary (if oil has entered), in wider areas where the currents are weaker, to prevent critical coastal contact.

The California Coastal Commission is currently reviewing the oil spill response/cleanup capabilities of all the California Oil Spill Cooperatives. A final report is pending. Additionally, if Proposed Sale No. 73 proceeds as scheduled and leases are issued, a detailed oil spill contingency plan is required by MMS as part of any exploration or development plans before any drilling may proceed.

b. Cooperatives: The oil companies have pooled their resources by forming oil spill cleanup cooperatives. The co-op serving the Proposed Sale No. 73 area is Clean Seas. In addition, there are seven other co-ops on the West Coast, there is the Coast Guard Pacific Strike Team located in San Rafael, and there are other Coast Guard Facilities with oil spill cleanup capabilities, which would all be accessed in the event additional assistance is required (all available equipment and personnel from around the country would be made available in the event of a catastrophic spill). The co-ops and the Coast Guard are on 24-hour call and have several vessels dedicated for clean-up operations. The co-ops have the capabilities as called for by the commandant notice (mentioned above) to respond to an oil spill emergency within 6-12 hours with pre-staged equipment, and 48 hours with additional equipment for extraordinary spills. The Pacific Strike Team has the Air Deliverable Anti-Pollution System, which could be used for a tanker spill anywhere along the coast, including areas inaccessible by roads.

The oil spill co-ops will expand their operating budgets proportionately, as increased offshore oil activity requires additional equipment and personnel to maintain an adequate level of protection and preparedness. The co-ops are constantly evaluating and purchasing new equipment, as the clean-up industry is rapidly changing. The equipment inventories for the co-ops and the Coast Guard Pacific Strike Team are included in Appendix D.

c. Contingency Plans: To implement the Clean Water Act (1973), as amended, the President's Council on Environmental Quality (CEQ) developed the National Oil and Hazardous Substances Pollution Contingency Plan. It follows specific legislative directions to include: 1) the duties and responsibilities of each Federal agency in coordination with State and local agencies; 2) a strike force of trained personnel available to provide the earliest possible alert to a discharge; 3) a system of surveillance to provide the earliest possible notice of a discharge; 4) a national center to coordinate the plan; and 5) procedures and techniques for identifying, containing, and removing the discharge or dispersing it, if necessary.

In addition, the CEQ requires a detailed oil spill contingency plan be on file with the MMS and the U.S. Coast Guard for every exploration and development plan submitted. This plan shall include emergency procedures and contact personnel, documentation of environmental areas to be protected, actual plans to follow in the event of a spill, containment and cleanup measures, and oil spill response training requirements.

The Environmental Protection Agency and the Coast Guard are the enforcing agencies for the Clean Water Act. These agencies have the authority and the capacity to marshal the nation's capabilities to combat oil spills.

As a standard part of any OCS lease, OCS Order No. 7 requires oil spill equipment to be at the site of any drilling or development operations, and all of the requirements listed above to be met, including a detailed site specific oil spill contingency plan. As discussed earlier, the Commandant Notice No. 5740 effective June 1, 1982, lists guidelines for contingency plans, and is included in Appendix C.

3. Groundwater Protection: The isolation of freshwater strata from potential contaminants in a borehole is ensured by well casing, cementing, and plugging regulations set forth in the Code of Federal Regulations (30 CFR 250.41) and OCS Order Nos. 2 and 3. These regulations set forth the procedures to be undertaken during drilling and abandonment of OCS wells in order to ensure the isolation of oil, gas, and freshwater zones in the strata in which they are found, and prevent them from escaping into other strata or to the surface.

These measures should effectively maintain the purity of any freshwater aquifers which might be drilled through during OCS exploration and development activities.

The occurrence and offshore distribution of freshwater aquifers has been discussed in detail in "Oil and Gas Development in the Santa Barbara Channel Outer Continental Shelf Off California" by the USGS (1976), pages II-60 through II-70.

4. Exploration and Development Plans: The OCS Lands Act Amendments of 1978 places requirements on lessees relative to Exploration and Development Plans. This section will note particular aspects of these Plans as they relate to exploration and development activities in the Proposed Sale No. 73 area.

The holder of an OCS oil and gas lease is required to submit an exploration plan and accompanying environmental report before exploratory drilling can begin. The plan and report is submitted for approval to the Pacific region MMS office. Federal agencies (USFWS, NMFS, NPS, and USCG) and State agencies (CCC, CDFG, CARB, CDOG, CSLC) review and make recommendations to the MMS on all exploration plans. In addition, any affected local governments or any interested person may submit comments and recommendations. The CCC determines whether the proposed activities are consistent with the State's coastal zone management program.

The MMS uses the review comments of the other agencies in the preparation of an Environmental Assessment (EA). The proposed plan will be approved if the EA shows that the plan will not result in significant effects on the quality of the human environment. This approval results in a Finding of No Significant Impact (FONSI). If it is determined that approval of the plan would constitute a major Federal action (i.e., proposed oil and gas exploration functions) that would significantly affect the quality of the human environment, an EIS must be prepared. On the basis of the EA, EIS findings, and the technical review by MMS, the exploration plan is approved, rejected, or modified.

The following sections describe the contents of the exploration plans and environmental reports.

Exploration Plan. Each exploration plan must include, but is not limited to: 1) the proposed type and sequence of exploration activities; 2) a description of drilling vessels, platforms, and other structures to be attached to the seabed, including safety and pollution prevention and control features; 3) a geophysical survey report; 4) the location of each proposed well, including surface and projected bottom hole locations; 5) an Oil Spill Contingency Plan that describes the procedures, personnel, and equipment that are to be used for preventing, reporting, and clean up of oil spills on waste material; and 6) other relevant geological and geophysical information.

Environmental Report. The ER includes, but is not limited to: 1) a detailed description of onshore support and storage facilities; 2) the estimated number of people expected to be employed; 3) boat and aircraft patterns; 4) the quantity and composition of wastes and pollutants; 5) major supplies, services, and resources needed for implementation of the plan; 6) potentially hazardous or environmentally sensitive areas, including archaeological and cultural sites; and 7) a statement of coastal zone consistency. An assessment is also made of the direct effects of plan implementation on onshore and offshore environments.

A plan is also required prior to development and production on any lease within the Pacific OCS region. As with proposed exploratory operations, an Environmental Report is necessary. The development plans and associated ER are usually much more comprehensive than those for exploration.

Minerals Management Service prepares an EA after receiving review comments and recommendations from State and Federal agencies. If State and Federal agencies jointly prepare the assessment, the resulting document is referred to as an environmental impact report/environmental assessment (EIR/EA). The State CCC also prepares a consistency determination. As with exploratory plans, MMS will either issue a FONSI or a FOSI (finding of significant impact).

If a FOSI is found, an EIS must be prepared. On the basis of the EA, EIS findings, and the MMS technical review, the development/production plan is approved, rejected, or modified.

One development and production plan, in a frontier area, is considered a major Federal action. As such, preparation of an environmental impact statement is required, including all the attendant procedures of the National Environmental Policy Act of 1969. Development and production plans in accordance with Section 19 of the OCS Lands Act as amended, must allow 60 days for comments and recommendations from the Governor and/or Executives of any affected local governments. In addition, any interested person may submit comments and recommendations.

5. Aircraft Overflight Restrictions: Aircraft are presently restricted by existing State and Federal regulations from flying at altitudes below 1,000 feet near important pinniped and seabird terrestrial habitats on the Channel Islands, Ano Nuevo and Farallon Islands.

6. Notice to Lessees and Operators: These notices have the same effect or status as OCS Orders and Regulations and are used when expeditious clarifications, corrections, or additions to the orders and regulations are necessary.

The following NTL's are now in effect:

NTL No.	Effective Date	Title
77-3	March 1, 1977	Minimum Cultural Survey Requirements OCS Exploratory Drilling
78-1	October 23, 1978	Minimum Requirements for Biological Surveys
78-2	October 23, 1978	Group Billing Procedures for Meals and Lodgings
79-1	June 22, 1979	Amends NTL 78-2
80-1	February 13, 1980	Furnishing Food, Quarters, and Transportation to MMS Personnel
80-2	March 20, 1980	Minimum Requirements for Environmental Reports
81-2	July 6, 1981	Geological Hazard Survey Requirements for OCS Exploratory Drilling
82-1	April 8, 1982	Cancels Provisions of 80-1
82-2	May 3, 1982	Minimum Requirements for Hazard Surveys on Pipeline Routes
82-3	May 28, 1982	Minimum Requirement for Exploratory Plans on the California OCS
82-4	August 30, 1982	Interim Minimum Requirements for Marking of Equipment

The purpose of these notices is to keep lessees and operators informed as to what the MMS requires prior to approving proposals to conduct exploratory drilling operations. The complete text of Notices to Lessees and Operators which are currently in effect for the Pacific OCS area are on file with Minerals Management Service, Los Angeles, California.

NTL 77-3: Minimum Cultural Survey Requirements - OCS Exploratory Drilling: The NTL establishes high-resolution geophysical survey equipment requirements for surveys for suspected cultural resources and the summary report format. A magnetomer, a dual side-scan sonar, a water depth recorder, and an acoustic subbottom profiler are required at the minimum to survey for suspected cultural resource sites prior to bottom disturbing exploratory activities, such as drilling. The surveys are usually run jointly with the shallow drilling hazards survey, information from the shallow drilling hazard survey may be used if the coverage is adequate for cultural resource identification needs.

NTL 77-3 is currently in the revision process to clarify report standards and to specify other activities requiring cultural resource surveys, i.e., platform installation and pipelaying activities. The current NTL is in effect until a new one is issued.

NTL 78-1: Minimum Requirements for Biological Surveys: This NTL establishes biological survey requirements on those leases for which the Biological Stipulation (Section II.A.1.f) has been invoked. The purpose of the survey is to document the species composition and approximate population densities of benthic and pelagic macroorganisms. The survey also includes observations of fisheries, seabird and marine mammal activities. Minimum acceptable survey and report standards are set forth.

NTL 80-2: Minimum Requirements for Environmental Reports: This NTL serves as a guideline to provide methods of compliance with 30 CFR 250.34-3(a) and (b), and to assist the lessee in preparing the environmental reports as required prior to commencing activity on the OCS. These guidelines were prepared to assist the applicant in preparing an environmental report of sufficient adequacy to meet the needs of MMS in preparing NEPA documents and to assist the State(s) in making consistency certification determinations. The guidelines include format and context requirements.

NTL 81-3: Geologic Hazard Survey Requirements for OCS Exploratory Activity: This NTL supercedes NTL 77-2 as of July 6, 1982. The high-resolution geophysical survey is required to investigate potentially hazardous conditions which could affect the safety of OCS operations. The NTL identifies the generic types of equipment required for the survey, data parameters, and the report format. The type of data to be submitted is also identified.

NTL 82-2: Minimum Requirements for Hazard Survey for OCS Pipeline Routes: The NTL lists the data requirements and equipment parameters for a hazard survey of proposed pipeline routes. The report requirements are also stated.

NTL 82-2: Requirements for Exploratory Operations OCS California: This NTL summarizes the requirements and procedures for approval of Exploration Plan and Application for Permits to Drill (APD). The NTL provides further information on the contents of Exploration Plans as specified in 30 CFR 250.34-1 and on the information to be submitted with an APD in addition to that specified in 30 CFR 250.36.

7. Fishermen's Contingency Fund: The Fishermen's Contingency Fund of the OCS Lands Act Amendments of 1978 was established to compensate commercial fishermen for property or economic loss caused by obstructions due to oil and gas activities on the U.S. Outer Continental Shelf (OCS). Management of the Fund was given to the Secretary of Commerce and is currently administered by the National Marine Fisheries Service of NOAA. The Fund's provisions have been recently amended by PL 97-212, passed June 30, 1982, to simplify the submission of claims and reduce the time required for processing claims. Revised regulations were published in the Federal Register on November 1, 1982 (50 CFR Part 296).

The Secretary has available a fund not to exceed $2,000,000 at one time (increased from $1,000,000) to compensate commercial fishermen for damages caused by materials, equipment, tools, containers, or other items associated with OCS oil and gas exploration, development, or production activities. (The area accounts established by the OCSLAA have been abolished except for accounting purposes.) The Fund is available to cover administrative costs, claim costs (vessel or gear damage, economic loss), and reasonable attorney's fees if the claim is accepted. Compensation for economic loss is based on 25% of the gross income the fisherman would lose by not being able to engage in fishing or having to reduce his fishing effort (rather than loss of profits). Damages are not paid to the extent that damages are due to the fisherman's negligence or fault, in excess of the replacement value of the equipment, or for any portion for which the claimant has received or will receive compensation from insurance.

Damages are presumed to be due to OCS oil and gas activities if the commercial fishing vessel was being used for fishing in an area affected by OCS activities, and a report is made on the location of the item causing damages and the nature of the damages within 15 days of the vessel's return to home port (rather than 5 days after damages discovered). Also, there must be no record of any OCS related items on the most recent nautical charts issued by the National Ocean Survey, NOAA or in any weekly Notice to Mariners issued by the Defense Mapping Agency Hydrographic/Topographic Center in effect at least 15 days prior to the damages, and there must be no proper surface marker or lighted buoy near the items. However, in the case of damages caused by a pipeline, the presumption will be available regardless of whether the pipeline was recorded on charts or in the Notice to Mariners. Damage or loss occurring within a one-quarter mile radius of obstructions recorded on charts or in a Notice to Mariners, or properly marked, is presumed to involve the recorded or marked obstruction and to be due to negligence or fault of the claimant and may not be totally compensated.

All claimants (including those who filed 15-day reports to gain presumption of causation) must file a more detailed claim no later than 60 days, after the date the damage or loss is discovered. The Secretary of Commerce must accept or reject a claim for consideration within 60 days of the claim being accepted for filing. If no petition to review the initial determination is filed within 30 days, the initial determination becomes the final determination. (This 90-day period compares to 120 days allowed previously and an actual average time of 22 months for claims filed to date since the claims will now be reviewed administratively by NMFS rather than by an Administrative Law Judge.) After claims are paid, the Secretary may recover payments from the party who is responsible for the damages, if a responsible party is identified. (Previously, no payments were made if damages could be attributed to a financially responsible party.) Any person who feels they have been wronged by a final determination may seek judicial review within 30 days of the final determination. The Secretary is required to submit an annual report to Congress that includes the claims received, compensation awarded, and the number of cases determined to be a result of OCS oil and gas activities.

Money used by the Fund to pay claims comes from the oil and gas industry. Lease holders, holders of an exploration permit, or an easement or right-of-way for a pipeline are assessed a fee not to exceed $5,000 per year per lease, permit, easement, or right-of-way. To reduce conflicts, the Secretary must identify and classify all potential hazards to commercial fishing caused by OCS activities including all obstructions on the bottom, throughout the water column, and on the surface. (The requirement to conduct a survey of natural and manmade obstructions has been repealed.) To assist in identifying responsible parties, the Secretary of the Interior must establish regulations requiring marking of all equipment, materials, tools, containers or other items used on the OCS (refer to Notice to Lessees and Operators 82-4).

8. Fishing Vessel and Gear Damage Compensation Fund: The 1978 amendments to the Fishermen's Protection Act, established a Fishing Vessel and Gear Damage Compensation Fund. As amended, this fund is designed to compensate fishermen for: 1) fishing vessel casualties that are attributable to any foreign vessel (or its crew or fishing gear), and 2) fishing gear casualties that are attributable to any other vessel (or its crew or fishing gear), whether or not such vessel is a vessel of the United States. The National Marine Fisheries Service of NOAA administers the Fund. Final regulations were published in the Federal Register on December 3, 1981 (50 CFR Part 258).

A claim for compensation must be made within 90 days after the damage was discovered by the owner. Unobserved casualties to fishing gear are presumed to be due to another vessel, its crew or its gear and, therefore, eligible for compensation unless NMFS has reason to believe the casualties were caused by other factors such as weather. The claimant must provide detailed inventory lists of owned equipment involved in the casualty for determination of repair cost or depreciated replacement cost of the damaged item, whichever is less. Economic loss is also recoverable but not to exceed 25% of gross income lost because of not being able to engage in fishing activities or having to reduce fishing activity during the repair or replacement period. Compensation will be reduced to the extent that any negligence of the applicant contributed to the casualty and by the amount the applicant has or reasonably would have received from insurance, whether or not such insurance was in effect at the time the casualty occurred. A $75 filing fee is required and a four percent administrative fee is deducted from any award made.

An initial determination of claim validity generally is made within 60 days of receipt of the claim application. If no petition to review the initial determination is filed within 30 days, the determination becomes final.

Monies for the fund comes from any funds recovered from parties responsible for the damage, surcharges collected from foreign fishing vessels, administration fees and obligations issued by the Secretary of the Treasury to provide monies for the Fund.

This Fund was not established to provide compensation for fishing vessel or gear damaged by OCS oil and gas vessels, but it is available and has been used for this purpose.

9. Oil Pollution Compensation Fund: Title III of the OCS Lands Act, as amended, establishes in the U.S. Treasury an Offshore Oil Pollution Compensation fund to be administered by the Secretary of Transportation. This fund provides compensation for any person suffering direct or actual injury caused by the discharge of oil from an offshore facility or vessel. A fee of not more than 3 cents per barrel of oil produced on the OCS provides the monies for the fund. The fees collected may be modified or increased to maintain the fund at a level between $100 and $200 million.

Claims for economic loss that arise out of, or directly resulting from, oil pollution may generally be asserted against the fund by any claimant for damages and removal costs. A U.S. claimant (who owns or leases property so damaged or who utilizes a natural resource involved) may file for injury to or destruction of real or personal property, loss of use of real or personal property, and loss of use of natural resources. The President may assess claims for injury to or destruction of natural resources over which the Federal Government exercises sovereign rights or exclusive management authority, as may a State for natural resources owned or managed by the State. Lost profits or impaired earning capacity may be claimed by a United States claimant who derives at least 25 percent of his earnings from activities using property or natural resources affected by oil pollution. Federal, State, and local governments may also assert claims for tax revenue lost due to injury to real or personal property.

Owners and operators of offshore facilities are held strictly liable for all loss attributable to oil pollution from their facilities. Except in cases of gross negligence, willful misconduct, or violation of safety regulations, vessel liability is limited to $250,000 or $3900 per gross ton, whichever is greater. For an offshore facility, liability is limited to the total clean up and removal costs, and $35 million in damages. Evidence of financial responsibility adequate to satisfy the maximum amount of liability must be provided. Congress is currently raising this amount to $75 million.

Upon payment of compensation for economic loss compensable under Title III the fund becomes subrogated to all rights, claims, and causes of action of the claimant.

C. Interrelationships of Proposal with other Projects and Proposals

1. National Parks and Sanctuaries: Under the Marine Protection, Research, and Sanctuary Act of 1972 (16 U.S.C. 1431-1434), the Secretary of Commerce with the approval of the President is empowered to designate areas as Federal marine sanctuaries for the purpose of preserving or restoring such

17 areas for their conservation, recreation, ecological, or esthetic values, following consultation with the Secretaries of State, Defense, Interior, and Transportation, with the Administrator of EPA, and with other interested agencies. Once an area is designated a marine sanctuary, the National Oceanic and Atmospheric Administration Office of Coastal Zone Management is required to issue "necessary and reasonable regulations" for control of activities permitted within the marine sanctuary. Multiple uses (including oil and gas development) could be permitted within a marine sanctuary, providing these uses can be carried out consistent with the regulations governing the sanctuary.

The Point Reyes/Farallon Islands National Marine Sanctuary in the Bodega Basin is the only sanctuary in Central and Northern California at the present time. Oil and gas exploration and development is not allowed in this marine sanctuary.

Pipelines related to operations outside the Sanctuary may be placed at a distance greater than 2 miles from the Farallon Islands, Bolinas Lagoon, or any Area of Special Biological Significance. No person shall operate any vessel engaged in the trade of carrying cargo, including but not limited to tankers and other bulk carriers and barges, or any vessel engaged in the trade of servicing offshore installations.

Two additional sanctuaries are possible for Central and Northern California in the future. The Monterey Bay area is proposed, but the exact boundaries have not been determined. The subtidal Cordell Bank, near San Francisco, has been nominated. If the areas become sanctuaries, oil development may not be excluded within their boundaries.

In Southern California, there is the Channel Islands National Marine Sanctuary extending 6 nm. around the northern Channel Islands in the Santa Barbara Channel. It has similar oil development restrictions to the Point Reyes/Farallon Islands Sanctuary.

National Parks include: The Point Reyes National Seashore includes the Point Reyes peninsula (64,546 acres) which was designated in 1982 "to save and preserve, for the purposes of public recreation, benefit, and inspiration, a portion of the diminishing seashore that remains undeveloped. The Point Reyes Wilderness Area includes much of the same area and extends from the mouth of Tomales Bay to the Point Reyes Bird Observatory, consists of 24,200 acres of wilderness and 8,530 acres of potential wilderness addition (see Section III.B.10). The Outer Continental Shelf Lands Act Amendments of 1978 prohibit any exploration or development within 15 miles of the boundaries of the Point Reyes Wilderness Area unless California issues a permit for such activities in State waters.

2. California Oil and Gas Sanctuaries: The State of California has designated oil and gas sanctuaries in Central California. The Oil and Gas Sanctuaries extend to the three-mile limit of the State's jurisdiction (Figure IV.C.2-1). The Oil and Gas Sanctuaries are specifically excluded from oil and gas leasing through Chapter 1724 of the Statutes of 1955, the Cunningham-Shell Tideland Act. The Oil and Gas Sanctuaries are administered by the State Lands Commission. There is no restriction on the placement of pipelines through the sanctuaries as a result of Federal OCS activity.

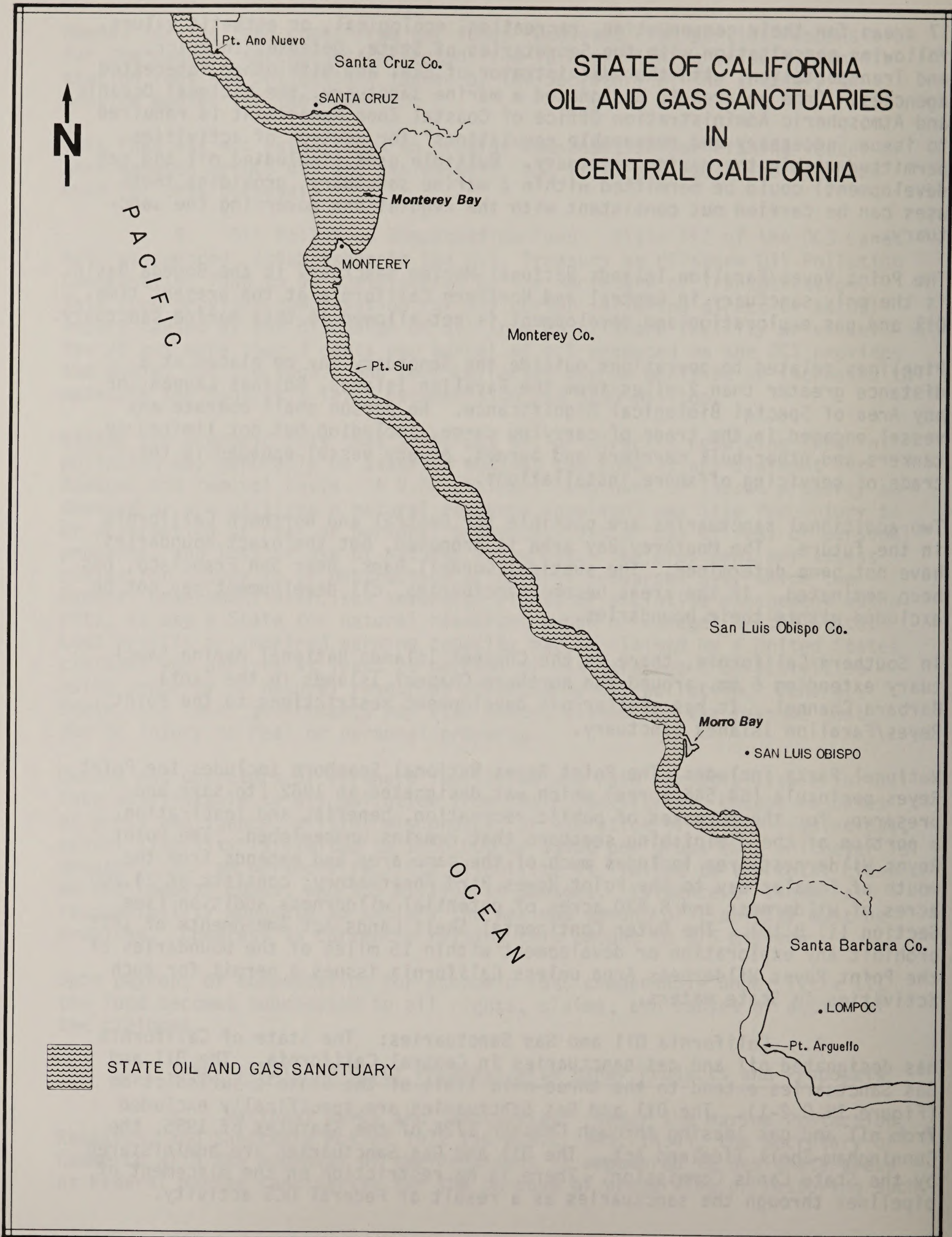

FIGURE IV.C.2-1. STATE OF CALIFORNIA OIL AND GAS SANCTUARIES IN CENTRAL CALIFORNIA

3. Existing Oil and Gas Activities

a. State: Exploration and development of oil and gas has been in existence in the Pacific Region since 1896. That year, the first shallow wells beneath the ocean surface were drilled from wharves in the old Summerland field located in the Ventura Basin. In 1929, the first State leases were issued in the offshore areas of California. After the Santa Barbara Channel Oil Spill in 1969, the State Lands Commission declared a moratorium on all new exploratory or production drilling the State waters. The majority of exploratory drilling presently being performed are on State leases awarded in the 1950s and 1960s. Nine platforms and three production islands are presently operating on these leases. Located within the leases are areas containing subsea completions. For the approximate location of the platforms, offshore islands, and subsea completions see Figure IV.C.3-1.

The last State offshore lease sale was held in 1969. The State Lands Commission has recently been authorized by the legislature to develop the programs necessary to lease approximately 40,000 acres of State tide and submerged lands for possible oil and gas development. These lands are located offshore Santa Barbara County between Point Conception and Point Arguello and extend from the mean high tide line to the three-mile seaward limit for State jurisdiction (see Section IV.D.4).

The following offshore fields contain platforms or production islands within the three-mile limit for State jurisdiction:

Conception Offshore Field. The Conception Offshore Field, east-southwest of Point Conception is situated in State Leases PRC 2725 and PRC 2207. PRC 2725 was acquired by Texaco in 1961. On the lease is located an inactive Platform Herman and 19 inactive subsea completions. A Final Environmental Impact Report (FEIR) has been prepared to allow the resumption of exploratory drilling on this lease. PRC 2207 was "quit" claimed to Phillips, Exxon, and others in 1975. A former Platform Harry has been removed.

Carpinteria Field. The Carpinteria Field is situated in both Federal and State waters southeast of Santa Barbara. Within the State waters there are two Leases PRC 3150 and 4000. State Lease PRC 3150 and PRC 4000 was acquired by ARCO-Chevron in 1964 and 1966, respectively.

Platform Heidi is situated on PRC 3150 with one producing well. Platform Hope is situated on PRC 4000 with 4 producing wells.

Cuarta Offshore Field. A portion of the Cuarta Offshore Field, east of the Conception Offshore Field, is contained in State Lease PRC 2206. PRC 2206 was acquired by Texaco in 1958. On the lease is one inactive Platform Helen and nine idle wells. A FEIR has been prepared to allow the resumption of exploratory drilling within the lease.

South Ellwood Field. South Ellwood Field, southeast of Capitan, is contained in State Leases PRC 3242 and PRC 3120. These leases, PRC 3242 and PRC 31230, were acquired by ARCO-Mobil in 1965 and 1964, respectively. Platform Holly

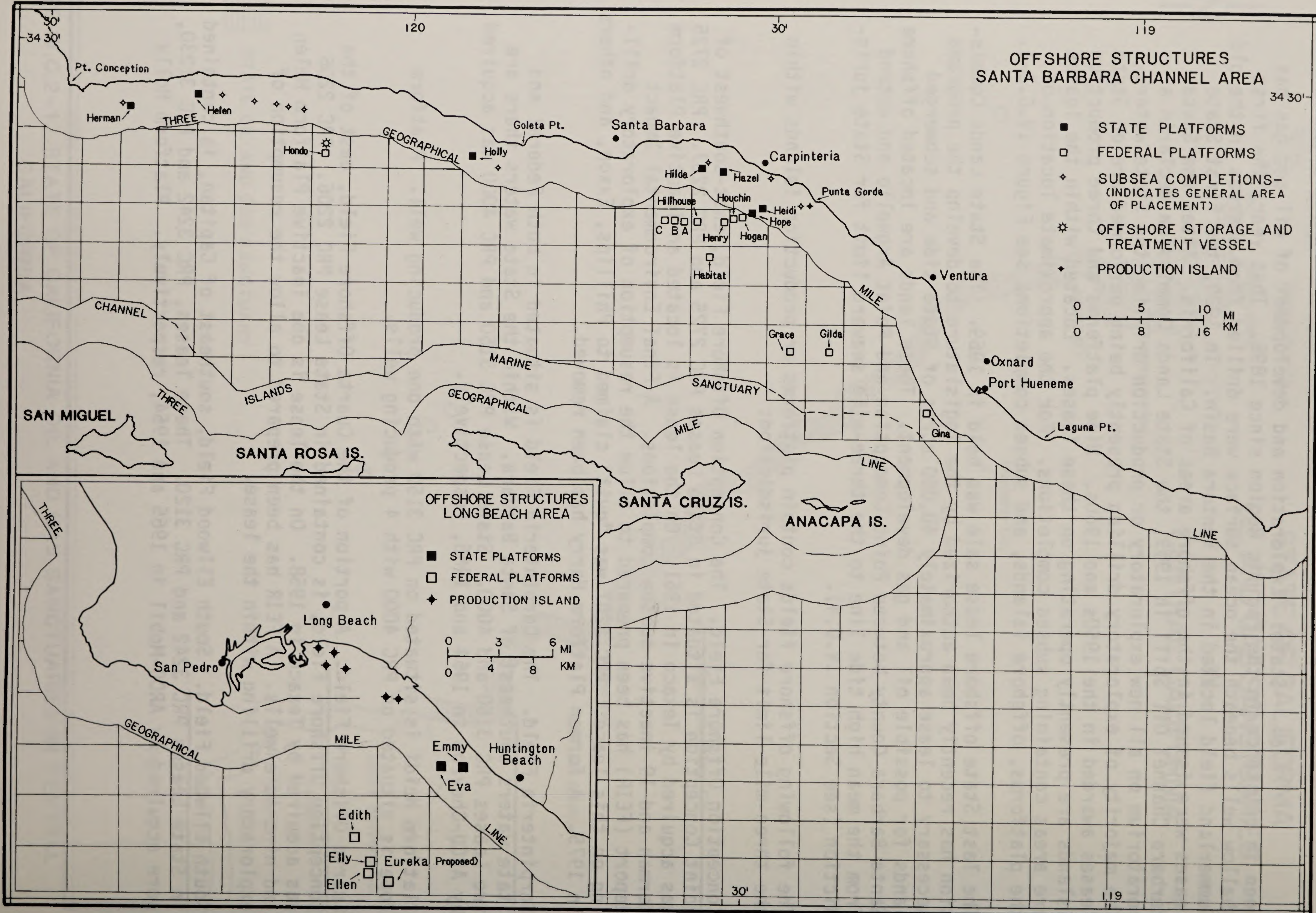

FIGURE IV. C.3 - I

is situated in PRC 3242 while 9 active wells are located in PRC 3120. A FEIR has been prepared to allow for the resumption of exploratory drilling on both leases.

Summerland Field. Summerland Field, southeast of Santa Barbara, was the first offshore field to be drilled in 1896. The field is located in State Lease PRC 1824 and was acquired by Chevron-Exxon in 1957. Two platforms, Heidi and Hazel, are presently producing on this lease.

Rincon. The Rincon field is located northwest of Ventura. State Lease PRC 1466 was acquired by ARCO in 1955. Located on the lease is production island Rincon.

Wilmington Field. The Wilmington Field is situated both onshore and offshore in the Long Beach area. Two State Leases PRC 186 and 2095 are located at the eastern end of the field. PRC 186 was acquired in 1945 by Exxon-Texaco.

PRC 30-95 was acquired by Chevron in 1964. Located on these leases are two production islands, Monterey (PRC 186) and Esther (PRC 3095). (Esther was severely damaged by a winter storm March 2, 1983. Reconstruction is expected to occur.)

Located west of the State Leases are State granted lands which were transferred to the City of Long Beach. On these lands are four production islands Grissom, Freeman, White, and Chaffee.

Huntington Beach Field. The Huntington Beach Field is located south of Huntington Beach. A portion of the field is contained in State Lease PRC 425 and PRC 3033. PRC 425 was acquired by Aminoil in 1950. PRC was acquired by Union in 1963. Two platforms, Emmy and Eva, are producing on these leases.

b. Federal: Since 1896 there have been eight Federal lease sales off the coast of California: 1963 Sale; 1966 Sale; 1968 Sale; Sale No. 35 (1975); Sale No. 48 (1979); Sale No. 53 (1980); Sale No. 68 (1982); and RS-2 (1982). For a complete discussion of the history of the lease sales refer to Section I.C in this EIS and Appendix VIII in the FEIS for Lease Sale No. 68 (BLM, 1981). Tables IV.C.3-1 and IV.D.4-1 contain a summary of the leasing, exploration, development, and production on the POCS.

Exploration from these leases is an ongoing process. An exploration well is drilled primarily for the purpose of determining if oil and gas actually exists in a formation. It is only after a well has been drilled into the formation that the presence of oil and gas can definitely be confirmed or denied. Currently, there are several exploratory rigs (jack ups, drill ships, and semi-submersibles) off the Southern and Central California coast evaluating the oil and gas potentials from the previous sales. An average of 10 to 16 exploratory wells a year have been drilled since 1978.

Development wells are drilled after an exploratory well has confirmed the presence of petroleum in the formation. The majority of the Pacific OCS oil and gas discoveries have been made on tracts which were leased in 1968.

TABLE IV.C.3-1

CALIFORNIA PACIFIC OCS OIL AND GAS LEASING STATISTICS

SALE	LEASE NOS.	NOMINATED	SELECTED	OFFERED	BID	LEASED	TERMINATED	CURRENT
1963	7-64	174	N/A	129	58	57	57	0
1966	166	N/A	N/A	1	1	1	0	1
1968	167-241	150	N/A	110	75	71	37	34
No. 35	242-311	1350	297	231	70	56	52	4
No. 48	315-369	970	217	148	55	54	3	51
No. 53	393-453	1743	242	111	81	55*	0	55
No. 68	456-490	609	218	140	35	29	0	29
RS-2	491-502	N/A	N/A	27	12	10	0	10
Total		4997	974	897	387	333	149	184

Nominated = Tracts nominated
Offered = Tracts offered for sale
Selected = Tracts selected for study in the EIS
Bid = Tracts bid
Leased = Bids accepted by BLM, USGS
Terminated = Terminated leases
Current = Leases within the 5-year term and 10-year term, and those held by production, unitization agreements, or suspension of operations

*The decision on acceptance of 19 bids received from Sale No. 53 is pending results of litigation

Compiled by MMS February 1982

Three recent discoveries have been made between Point Conception and Point Arguello.

In November 1981, Chevron disclosed information concerning an oil strike on a tract acquired in Lease Sale No. 48. The Point Arguello discovery is located on Federal Lease OCS-P 0316 about 10 miles (16 km) west of Point Conception. Chevron has submitted a development and production plan for this lease.

In June 1982, Texaco announced the discovery of oil on Federal Lease OCS P-315. It is possible that Texaco has tapped the same structure as Chevron. Texaco is expected to submit a development and production plan for the lease in the near future.

In October 1982, Chevron and Phillips announced an oil discovery on OCS P-450 located northwest of their OCS P-0316 discovery tract. Two recent discoveries have also been made north of Pt. Arguello by Oxy and Union on leases OCS P-0409 and P-0441 respectively.

There are presently five units/fields which have current or proposed oil and gas development. Figure IV.C.3-1 shows the approximate locations of existing and proposed platforms and the Offshore Storage and Treatment vessel (OS&T) in the Pacific Region.

Santa Ynez. The Santa Ynez Unit is a consolidation of nineteen leases on the Federal OCS in the Santa Barbara Channel. Seventeen of these leases were acquired in the Lease Sale of 1968 and two were acquired in Lease Sale 48. The Hondo, Sacate, Pescato, and Government Point oil fields are located within the unit boundaries.

Production from the Santa Ynez Unit, which was initiated on April 2, 1981, from Exxon's existing Hondo A platform, will develop only the eastern portion of the Hondo field. Exxon has submitted a development and production plan which calls for three to four additional platforms to develop the Sacate, Pescado, and western Hondo fields.

Oil from the Hondo A platform is currently processed on an OS&T. The storage and treatment capacity of the OS&T may be expanded if additional platforms are installed in the unit.

Santa Rosa Unit. The Santa Rosa Unit is located in the eastern portion of the Santa Barbara Channel. A modified plan of operation for the unit was submitted by Exxon. Three of the six leases have been relinquished and a plan was established for diligent drilling on the remaining leases. A request from Exxon for a suspension of operations was granted by Minerals Management Service for August 12, 1982 to August 12, 1983.

Carpinteria Offshore Field. The Carpinteria Offshore Field southeast of Santa Barbara is situated in both Federal and State waters. Discoveries in State waters prompted the 1966 drainage sale by the Federal Government. Two development and production plans were filed for the field's development. Phillips' plan resulted in the installation of Platforms Hogan and Houchin;

and Sun's plan resulted in the installation of Platform Henry.

Pitas Point Unit. The Pitas Point Unit southeast of Santa Barbara is composed of two leases acquired in the 1968 Sale. The first discovery on the lease was an oil strike in 1968 but no development has occurred. A second discovery in 1979 was a gas strike. Texaco has recently installed Platform Habitat, and development wells are being drilled.

Santa Clara. The Santa Clara Unit southwest of Ventura comprises eight leases in the southeastern portion of the Santa Barbara Channel. The first discovery within the unit was in 1970, subsequent discoveries by Chevron have led to the planning for production platforms. Presently, there are two platforms in the unit - Grace and Gilda. Future development by Chevron may include the installation of a third platform - Gail, but no development and production plan has as yet been submitted.

Hueneme Offshore Field. The Hueneme Offshore Field southwest of Oxnard is located within two leases in the southeastern portion of the Santa Barbara Channel. Union is developing the field and is currently producing from Platform Gina.

Dos Cuadras Offshore Field. The Dos Cuadras Offshore Field east of Carpinteria Field was leased in the 1968 Sale. The field is located in Sun's lease OCS-P 0240 and Union's OCS-P 0241. A series of discoveries in the field led to the development and installation of four Platforms A, B, C, and Hillhouse.

Beta Field. The Beta Field is located nine miles southwest of Huntington Beach. The field is located on OCS-P 0300, 0301, 0306 and 0296. OCS-P 0300 and 0301 were acquired by Shell, and OCS-P 0306 and 0296 were acquired by Chevron as a result of OCS Lease Sale No. 35. Platforms Ellen (drilling) and Elly (production) are located on OCS-P 0300. Production from Platform Ellen began in 1981. Chevron installed Platform Edith on OCS-P 0296 in late 1982. Another Platform Eureka is being considered for OCS-P 0301.

4. California Coastal Management Plan

The California Coastal Management Program (CMP) was approved by the Secretary of Commerce in 1978. The California CMP is comprised of two segments: The Management Program for San Francisco Bay (1977) which provides for resource management by the Bay Conservation and Development Commission (BCDC); and the California Coastal Act (1976) which, in addition to setting forth land use policies for the coastal zone, formally establishes the California Coastal Commission as the oversight body in coastal resource management for California. Any action that directly affects the coastal zone must be consistent, to the maximum extent practicable, with the California Coastal Management Plan. The BCDC and the California Coastal Commission review and concur with the determination on such actions.

The policies of the Coastal Act and the California Coastal Management Program address the following areas of concern: public access, recreation, marine environment, land resources (including environmentally sensitive habitats and agriculture), residential development, energy facilities siting, and industrial development.

Article 7 of California's Coastal Act deals with Industrial Development Planning and Management policies. Sections 30260-30263 of the California Public Resources Code address coastal-dependent industrial facility siting and policies relating specifically to oil and gas development.

In general, consolidation of energy and industrial facilities is encouraged by the State, except in situations where it is beneficial to choose new areas for this use.

The primary vehicle for implementing the CMP is the local coastal program (LCP). Each of 67 jurisdictions, those wholly or partially within the coastal zone as defined by the California Coastal Commission, must have an LCP approved and certified by the Commission before it can assume the permitting authority presently held by the Commission. Each LCP is comprised of two parts: a land use plan and zoning ordinances necessary to implement that plan. The two phases may be certified and approved separately, though permitting authority is contingent upon the adequacy of the entire LCP.

The energy facility planning process is developed and implemented through the process. The local jurisdictions identify possible energy facility issues to be addressed. This involves consultation and coordination with energy suppliers that may be interested in locating within the jurisdiction.

LCP's address other issues of major concern such as identifying and establishing policies for areas of sensitive or significant ecological habitats, wetlands, commercial/recreational boating and coastal uses. The LCP overlays or supercedes the local jurisdictions general plan and takes precedence in determining uses within the coastal zone. Table IV.C.4-1 summarizes the status of the Local Coastal Program for San Luis Obispo and Santa Barbara Counties.

D. Projects Considered in Cumulative Impact Assessment

1. Expansion of Vandenberg Air Force Base: The space shuttle and the MX programs have created the need for expansion of Vandenberg Air Force Base.

The space shuttle program calls for the ability to launch the orbiter in a polar orbit, in addition to the equatorial orbit. Restrictions on overflight of land during the ascent limits launches at the Kennedy Space Center to equatorial orbits. Launching from Vandenberg Air Force Base will permit the orbiter to be placed in a polar orbit, which is the preferred orbit for numerous defense, communications and other scientific purposes (Dept. of Air Force, 1978).

The expansion for the space shuttle will be restricted to constructing new facilities and modifying existing facilities, all within the perimeter of the Air Force Base. These include modification to the landing and taxiing facilities, modification of the tow route between the support facilities and the launch complex, modification of the launch facilities, and modification

TABLE IV.C.4-1

LOCAL COASTAL PLAN STATUS[a]

County	Land Use Plans in the Process[b]	Certified	Certified and Issuing Interim Permits	Zoning in the Process[b]	Certified[c]	Jurisdiction Issuing Permits
San Luis Obispo	1	2	0	1	3	Grover City

[a] Local Coastal Plans are composed of two phases, the plan or policy phase and the implementation phase. An LCP is not complete until both phases are certified as being in compliance with the California Coastal Act.

[b] The plan is not submitted, or partial certified with suggested modifications.

[c] These LCPs are complete and the jurisdiction has permit authority.

Source: California Coastal Commission, LCP Status Report, April 11, 1983.

of the Pt. Arguello Boat House.

The MX program calls for the missile flight testing to take place at Vandenberg Air Force Base. The expansion will be restricted to construction of new facilities and the modification of existing facilities. The construction and modifications include a rail transfer facility, a mechanical maintenance facility, an integrated test facility, a payload assembly building, stage modification facility, stage storage pads, a processing facility, a missile assembly building, and the basing mode test facility.

Impacts from the expansion to sewage and water supplies will occur on the Base, but will not affect the local area. Air quality is not expected to be affected by the expansion. The main impacts to the local area will be the increase in population and the increase in local traffic flow. The increase in population will impact public services in the local area.

To date, no construction for the proposed LNG facility has occurred. Applications have been submitted to the State Public Utility Commission to have the facility held for future use. Therefore, no impacts are anticipated in the immediate future.

Expansion of the Vandenberg facilities is expected to be completed by 1985. The space shuttle and MX programs will result in direct non-military employment at Vandenberg, increasing from 10,631 to 14,799 between 1980 and 1988.

Population is expected to increase by 12,500 for the area in the vicinity of Vandenberg. The increase in population resulting from Vandenberg expansion is expected to settle primarily in Lompoc and Santa Maria. The expected increase will peak in 1985 and level off in 1988 with the permanent net change being an increase of 8,500 people.

2. Point Conception LNG Facility: The proposed Point Conception LNG facility would unload, store, revaporize and send out LNG delivered by tankers. Western Terminal proposes to construct and operate two 550,000 barrel LNG storage tanks, nine seawater vaporizers, three gas-fired peaking vaporizers, a marine terminal capable of berthing and unloading LNG tankers with a capacity of up to 130,000 cubic meters (equivalent to 817,700 barrels of LNG or 2.84 billion cubic feet of gas), and other appurtenant facilities. The proposed Point Conception facility would revaporize LNG at an average plant output rate of 900 million cfd, with additional peaking capacity of 300 million cfd. Revaporized gas would be transported through a proposed 112.4 mile long, 34-inch diameter pipeline to Gosford, near Bakersfield, where the pipeline would join with existing gas transmission facilities owned and operated by Pacific Gas and Electric Company (PG&E).

The development of this facility should result in increased vessel traffic in the vicinity of Point Conception and the Santa Barbara Channel. Population and employment during construction of the facility should peak at approximately 9,263 and 3,865 persons, respectively. A large part of the work force used for construction of this facility is expected to come from workers that had been employed at Vandenberg AFB, resulting in a smaller net increase in population than would occur otherwise.

3. San Pedro Bay Coal Terminals: The Ports of Los Angeles and Long Beach are presently evaluating and pursuing the development of coal terminals in the San Pedro Bay. The proposed coal terminals are expected to be completed in the mid to late 1980s and handle 10 to 15 million tons of coal by 1990. The primary market for the coal passing through the San Pedro Bay harbors will be Japan. Annually, approximately 200-260 additional ships are expected to be serviced by the harbors.

4. Future Oil and Gas Exploration and Development Activity: Offshore oil and gas activities will occur as a result of previous Federal and State lease sale. This activity is summarized on Table IV.D.4-1. More detailed information on existing Federal and State leasing, exploration, and development activities is presented in Section IV.C.3. Information on on the Proposed Southern California Lease Offering, February 1984 is presented in MMS, (1983).

The State of California has proposed oil and gas leasing in State waters, between Point Arguello and Point Conception. The proposed tideland development is expected to be both a competing and complementing activity to Federal OCS Leasing.

State leasing will compete with Federal OCS leasing in the areas of oil company revenues, manpower, facilities and other needs of the oil industry. In contrast, State leasing is a complementary activity in that much of the facilities that would be developed for servicing either State or Federal OCS activities could be shared (i.e., treatment plants, pipelines, etc.).

Estimates of the undiscovered recoverable hydrocarbon resources within the proposed Point Conception - Point Arguello lease area were calculated. There is a 5 percent likelihood that at least 274 million bbl of oil and 219 billion cubic feet of natural gas would be recoverable from the area. Exploration and development estimates for the State Tidelands lease sale is contained in Table IV.D.4-1. These estimates are based upon eight separate, hypothetical resource bearing geologic structures. Employment and population as a result of this sale is expected to increase by 575 jobs and 1,300 people. The environmental impacts associated with the State Tidelands development refer to State Lands Commission (1982).

5. Port Hueneme Expansion: Expansion of Port Hueneme would be in the form of a transfer of facilities from the Navy to the Oxnard Harbor District. The new facilities and land (wharf and 20 acres) would primarily be dedicated to offshore oil and gas activities. However, expansion would also permit additional large ships for general commodity export and import, while allowing for growth in the number of supply and crew boats servicing offshore oil and gas activity.

6. Sewage Outfalls: Approximately 300 million gallons of effluents per day are discharged from the major San Francisco Municipal Sewage Outfall into the ocean. This contributes significant amounts of sewage to the ocean but should not interfere with any action from the proposed OCS lease sale. There are no conflicts expected between the two actions and impacts are not expected to add to any measurable degree to each other due to the distance between proposed action areas.

TABLE IV.D.4-1

OIL AND GAS EXPLORATION AND DEVELOPMENT ACTIVITY WITHOUT THE PROPOSAL

Area	BBO Produced	TCFB Produced	Exploration and Delineation Wells (Nos.)	Development Wells (Nos.)	Platforms (Nos.)	Artificial Islands (Nos.)	Subsea Completions (Nos.)	Subsea Pipelines (Nos./Miles)	Marine Terminals (Nos.)
SOUTHERN CALIFORNIA									
Federal Waters									
Existing[1]	.249	.132	222	430	15	0	0	21/110	1
Future-Reserves[2]	.861	1.733	0	445	6	0	5	*/*	*
Future-Resources[2]	.285	.567	122	265	6	0	5	*/*	*
Proposed Southern California Lease Offering 2/84	.270	.510	99	215	7	0	6	9/75	3
State Waters									
Existing[1]	*	*	*	*	9	7[7]	39	14/34	10[8]
Future-Reserves[2,3]	.527	.225	*	*	*	*	*	*/*	*
Future-Resources[2,3]	.334	.362	*	*	*	*	*	*/*	*
CENTRAL CALIFORNIA									
Federal Waters									
Existing[1]	0	0	13	0	0	0	0	0/0	0
Future-Reserves[2,4]	0	0	0	0	0	0	0	0/0	0
Future-Resources[2,5]	0.163+	0.163+	45	350	10	0	0	*/*	*
State Waters									
Existing[1]	0	0	0	0	0	0	0	0/0	7[8]
Future-Reserves[2]	0	0	0	0	0	0	0	0/0	0
Future-Resources[2]	0	0	0	0	0	0	0	0/0	0
Proposed Pt. Conception to Pt. Arguello Sale[6]	0.274	0.219	25	157	6	*	44	*/*	1
TOTAL FOR CALIFORNIA	not additive	not additive	526+	1862+	59+	7+	59+	44/219+	21+

Footnotes:

*Unknown

1. Activity completed as of February 1983.
2. Future activity expected as a result of existing leases (estimated). Reserves are proven supplies of oil and gas. Resources are oil and gas supplies that have not been proven.
3. Source: State Lands Commission letter to MMS dated January 14, 1983, and personal communication R. Moory, SLC, to L. Vesco, MMS, on May 5, 1983.
4. Although new oil and gas discoveries have been announced by the media, these are not officially proven supplies of oil and gas.
5. Resource numbers presented here take into account risks associated with exploration and development of oil and gas. Actual resources could be greater (see Footnote 4). Facilities presented here are the numbers expected based on the number and size of oil and gas fields found or expected to be found.
6. Source: State Lands Commission (1982). Estimates include one exploration and four development wells that are expected to be drilled onshore.
7. Includes four artificial islands located inside the breakwater at Los Angeles-Long Beach Harbors.
8. Does not include marine terminals located inside harbors and ports.
9. Most likely resource estimates and related activities. Although unlikely, if all oil and gas resources are leased, explored and developed, these estimates would be higher (see MMS 1983).

E. Environmental Impacts of Alternative I

1. Physical Environment

a. Impact on Water Quality

i. Discussion: This section provides an estimate of the impacts on water quality from the proposed sale, i.e., the change in water quality as a result of the activities associated with the proposed sale.

The definitions employed to describe the level of impacts to water quality expected to occur as a result of OCS oil and gas activities are found in Appendix A. In the discussion of impacts which follows, the level of impact is coupled with the descriptors long term (or chronic), short term (or acute), near field (close to the source or local), and far field (away from the source or regional). The level of impact will depend upon these descriptors so that an impact may be high in the short term but low in the long term. The condition of the environment is also considered in the impact analysis such that an oil and gas related activity on the OCS in a pristine region may have a higher level of impact than the same activity occurring near major urban centers where onshore activities may have already caused water quality degradation.

Throughout oil and gas development and operation, water quality will be decreased by: 1) resuspension of sediment through exploration and development activities and pipeline construction, 2) daily sewage discharge, 3) formation water discharge, 4) drilling muds and cuttings discharge, and 5) hydrocarbon discharge through potential accidents. The impacts on water quality of each of these except the second, sewage discharges, will be discussed below. Although sewage discharges add pollutants to the ocean, the volumes expected from Proposed Sale No. 73 (see Table IV.A.8.a-1) are insignificant in relation to the volume of receiving water. Marine organisms or water quality would not experience any changes due to sewage unless immediately under the discharge pipe. Therefore, sewage is not considered to be a significant impact agent and poses no significant environmental issues as regards the proposed action.

Bottom Sediments. Bottom sediments will be put in suspension during exploration and development activities with the emplacement of reentry collars, blowout preventers, and the placement of the five drilling platforms or other sea-bottom equipment. Additionally, sediments will be suspended during pipeline placement or burial. The impacts that could result from resuspension of bottom sediments are increased turbidity and, in areas of pollutant rich sediment, the potential for pollutants to be mobilized into the water column.

The magnitude and extent to which sediment will be put into suspension will be dependent on the bottom material type and grain size, prevailing water current and the duration of the activity. For most of the activities involved in positioning, anchoring, and installing subsea equipment such as reentry collars and blowout preventers, the impact should be low short term involving turbidity increases over one or two days and within several meters to several tens of meters of the activity. Pipeline burial will likely involve much quality are expected to disappear within a few hours after cessation of mud dumping.

Drill cuttings will be discharged along with muds as described in Section IV.A.8.a. The fate and effects of cuttings on water quality were discussed in the FEIS for OCS Lease Sale Nos. 53 and 68. The impact level on water quality of cuttings will be minimal because cuttings drop to the bottom or settle out rapidly from the discharge plume remaining in the water column only a short time. The more significant impacts from cuttings is on the benthic marine fauna and flora and are due to changes in sediment characteristics brought about by the accumulation of cuttings (see Sections IV.E.2.a to f).

Pipe lubricants and pipe joining compounds (dope) may introduce small amounts of trace metal and hydrocarbons into the ocean during routine oil and gas operations. The amounts are considered to be insignificant and pose no significant environmental issue from the proposed action.

Formation Water. Formation water (112,464 mbbls) will be discharged into the ocean once oil production begins. Discharged formation water will be dispersed (diluted) as the water mass moves away from the point of discharge but will change ambient ocean water quality near the discharge point. The main formation water characteristics affecting ocean water quality are petroleum hydrocarbons (oil), trace metals dissolved in formation water, and an absence of dissolved oxygen.

Formation water may have an impact on ocean water quality 1) when chemical constituents are raised above ocean ambient levels, and 2) when chemical concentrations of constituents are increased to a level that may have a deleterious effect on marine life. Ambient trace metal concentrations for surface ocean water off central-northern California and the highest concentration of metals in solution which are still "safe" (minimal risk) for marine aquatic life are given Table IV.E.1.a-1.

The trace metal concentrations in typical California formation water (Table IV.A.8.a-4) have been divided by 1,000 to represent 1,000-fold dilution and presented in Table IV.E.1.a-2 along with EPA 24-hour water quality criteria for comparison. The 1,000-fold dilution of formation water is what would be expected at a distance of 500 meters from the point of discharge. This estimate is based upon a numerical computer model formation water dispersion (Dickey, 1980).

Comparing the expected concentrations of trace metals in formation water after 1,000-fold dilution (500 meters from the discharge point) with EPA 24-hour criteria (Table IV.E.1.a-2) shows all metals below the EPA levels. For those substances without established EPA 24-hour criteria (arsenic, lead, silver, cyanide, and phenolic compounds), the concentrations after 1,000-fold dilution would be 2-3 orders of magnitude below the lowest levels for which effects on organisms have been demonstrated (Table IV.E.1.a-2). The data and calculations indicate all trace metals except zinc would be below the maximum concentrations that present minimal risk of deleterious effects to marine life (= maximum safe levels) (Table IV.E.1.a-1) after 1,000-fold dilution (500 meters from the discharge point).

TABLE IV.E.1.a-1

AMBIENT TRACE METAL LEVELS AND
MAXIMUM TRACE METAL LEVELS THAT PRESENT MINIMAL RISK TO MARINE AQUATIC LIFE

Concentration[a] Total Trace Metal	Central and Northern California Ocean Water: Ambient Ocean Water	Marine Aquatic Life: Maximum[b] Concentration That Presents Minimal Risk of Deleterious Effects to Marine Aquatic Life
Trace Metal	Surface	
Cadmium	0.004-0.025 ug/l	0.2 ug/l
Chromium	No data	0.05 mg/l
Copper	0.1 ug/l	0.01 mg/l
Lead	0.005.0-0.015	0.01 mg/l
Nickel	0.200	2.01 ug/l
Silver		1.0 ug/l
Zinc	0.005-0.030	0.2 ug/l

[a]Personal communication: Dr. K. Bruland, 1979.
[b]National Academy of Sciences - National Academy of Engineering, 1972

TABLE IV.E.1.a-2

COMPARISON OF ESTIMATED MAXIMUM SEAWATER CONCENTRATIONS OF TRACE CONTAMINANTS FOLLOWING 1,000-FOLD DILUTION OF CALIFORNIA OFFSHORE PRODUCED FORMATION WATER WITH EPA WATER QUALITY CRITERIA OR LOWEST REPORTED CONCENTRATION OF EFFECT (FEDERAL REGISTER, 45 No. 231, 1980)

Trace Constituent	Estimated Maximum Conc. after 1,000-fold dilution (ug/l)	EPA 24-hr Criteria (ug/l)	Lowest Reported Conc. of Effect (ug/l)
Arsenic	0.08	508	40[2]
Cadmium	0.18	4.5	
Total Chromium	0.04	18	
Copper	0.116	4.0	
Lead	0.28	663	25[3]
Mercury	0.002	0.10	
Nickel	0.29	7.1	
Silver	0.03	2.3	2.3[4]
Zinc	3.2	58	
Cyanide	0.004	2	2.0[5]
Phenolic Compounds	2.10	NE[1]	2560[6]

[1]Saltwater criteria for 24-hour average not established.

[2]Short-term effect, freshwater species.

[3]Chronic effect, saltwater species.

[4]Maximum allowable (instantaneous) saltwater concentration.

[5]Projected chronic effect, saltwater species.

[6]Chronic effect, freshwater species.

The impacts of formation water will probably be less than predicted by dilution factors based on Dickey's model because the model assumes no chemical reactions of trace elements in seawater. Impacts from formation waters are expected to be restricted to less than 500 meters from platforms; a radius inside of which impacts on water quality and possible impacts to biota are expected to be low (except for zinc) and outside of which impacts will be low to unmeasurable (except zinc). Impacts to the entire Proposed Sale No. 73 area considered as a unit are expected to be very low from formation water. Long-term localized and area wide impacts from formation water have not been studied on this coast but information from the Gulf of Mexico (Middleditch, 1981) leads one to expect very low impacts to water quality. (Cumulative formation water impacts are discussed in Section IV.E.1.a.)

Oil Spills. The predicted number of oil spills for the Proposed Sale No. 73 area is one spill of greater than 1,000 bbls. The fate and effects of this spill, should it occur, are subject to a variety of factors influencing the rate at which oil disappears from the environment, the populations of organisms affected, and extent of the impact on these populations. The type and quantity of spilled oil will influence the toxicity of the released hydrocarbons, crude oils being less toxic than refined petroleum products. The season during which a spill occurs will determine the degree to which water quality is degraded and the degree to which marine organisms are impacted. Winter oceanographic regimes in the lease sale area are characterized by large wind and wave energies which result in greater mixing of the surface water than occurs at other times during the year. Spills occurring during winter would, therefore, be expected to disperse more quickly and have less impact on water quality than spills during other seasons.

The most severe water quality degradation would occur during incoming tides in relatively calm waters of enclosed bays and estuaries. Severe impacts would be felt in these areas since surface slicks of oil in shallow areas would create high chemical oxygen demands relative to the volume of water underneath the slick, and organisms in these habitats would be much closer physically to the oil compared to open ocean slicks. In addition, physical processes, which would break up slicks and aid in weathering the oil, are usually reduced in estuaries, and enclosed bays. (See Section IV.E.2.g for the assessment of expected impacts to estuaries and wetlands.)

An excellent review, "Fate and Weathering of Petroleum Spills in the Marine Environment" by Jordan and Payne (1980) discusses in detail recent research into the factors affecting spilled crude oil.

A complex array of hydrocarbons and several trace metals (Table IV.E.1.a-3) are found in crude oil, some toxic and some more stable in the marine environment than others. Trace metals usually found in crude oils include nickel (Ni) and Vanadium (V) usually in the greatest concentrations but cobalt (Co), Mercury (Hg), iron (Fe), and zinc (Zn) can be abundant in crude oil as indicated for some crude oils from California (Table IV.E.1.a-3). The toxicity of nickel and vanadium was discussed in the FEIS for OCS Lease Sale No. 53. Nickel appears to be relatively nontoxic at the concentrations expected as is vanadium. However, vanadium has not been extensively investigated as to toxicity. Mercury could pose a serious threat at the levels noted in one crude oil if conditions did not permit dispersion and dilution (such as an

TABLE IV.E.1.a-3

TRACE ELEMENT CONTENTS OF 6 CRUDE OILS[a]

Elemental Conc (u g/g)[b]	RF[c]-1	RF-2	RF-3	RF-4	RF-5	RF-6
Ni	93.5	113.0	78.6	116.8	1.25	20.5
V	7.5	6.0	4.9	112.0	26.0	8.2
Co	12.7	13.9	14.5	0.198	0.001	0.0354
Hg	21.2	1.49	1.46	0.139	0.0143	0.0898
Fe	73.1	77.2	89.5	36.9	5.0	4.94
Zn	9.32	19.50	19.60	2.619	0.0907	9.08
Cr	0.634	0.685	0.729	0.380	0.1	0.081
Mn	2.54	3.10	2.96	0.21	1.50	0.79
As	0.656	1.63	0.67	1.20	0.2	0.0773
Au	2.8×10^{-6}			3.0×10^{-6}	10^{-7}	6.4×10^{-5}
Sb	0.0517	0.061	0.11	0.273	10^{-3}	0.055
Se	0.364	0.454	0.333	0.360	0.009	0.128
Sc	8.8×10^{-3}	9.0×10^{-3}	4.6×10^{-3}	4.4×10^{-3}	9.5×10^{-5}	10^{-5}
Cu	0.93	1.25	1.13	0.21	0.2	0.10
Na	11.1	65.2	15.5	25.0	1.0	13.0
Ca	192.0	75.1	103.0	150.0	20.0	20.0

[a]Oils RF-1, 2, 3 from California; RF-4, Venezuela, Louisiana and RF-6, Libya

[b]Conc = concentrations in ppm

From Filby and Shah (1971)

[c] = RF = reference oil

estuary trapped spill). It is impossible to predict, however, which if any crude oils with high mercury values might be found in the Proposed Sale No. 73 area.

The hydrocarbons in crude oil are a complex mixture of thousands of types of simple carbon chains and complex branched and ring carbon structures. The persistence of various classes of compounds in the marine environment differs as discussed by Jordan and Payne (1980) and, therefore, water quality will experience impacts from varying groupings of hydrocarbons with the increasing age of a spill or distance from a spill location. The level of impact to water quality from spills is based on the estimated resources in each of the basins and projections from historical spill data trend analysis.

PROPOSED SALE AREA

Approximately 500,000 cu. yds. of sediments would be moved during pipeline placement. Impacts to water quality from temporary localized turbidity increases would be very low and impacts due to mobilization of trace metals or chlorinated hydrocarbons would also be very low (probably not measurable). Sediments in the basin are not suspected to be high in either trace metals or hydrocarbons.

Approximately 348,000 barrels of cuttings and 112,000 barrels of muds are expected to be discharged into the southern portion of the Santa Maria Basin. The level of impact to water quality from this material is expected to be low (increases of 2-3 times ambient suspended particulates and trace metals lasting only a few hours) at distances greater than 1,000 meters from the discharge point. Impacts would be moderate (increases 2-3 orders of magnitude above ambient) within 300 meters of the discharge point. These levels are expected if the expected five platforms are scattered in the southern portion of the Santa Maria Basin. Should the five platforms be grouped on adjacent lease tracts the level of impact to water quality would be greater (moderate level impact over a much wider area) than described above. However, the grouping of platforms near each other is not expected.

Approximately 100,000 barrels of formation water would be discharged per day in the Santa Maria Basin during the peak production year with an average of 62,000 barrels per day for the expected 20-year life of the field. This discharge is expected from five platforms or an average of 20,000 barrels per day per platform at peak production and averaging 12,000 barrels per day per platform during the life of the field for each platform. The level of impact is expected to be low to very low outside a radius of 100 m from the discharge points. The exceptions to low or very low levels of impacts could occur should platforms be placed on adjacent tracts. In this case, formation water discharges could be additive from one platform to another leading to a zone of low to moderate impact on water quality over an extent of several lease tracts.

One oil spill greater than 1,000 barrels is expected in the proposed sale area as a result of the proposed action. The impact to water quality from the expected spill is expected to be moderate (increase in water column trace metals and hydrocarbons by factor of 2-3 orders of magnitude over ambient levels persisting for several days to a week depending on weather conditions, sea state, distance below or away from oil slick). This moderate level of impact could apply to the entire sale area if the spill occurs in the northern portion and is moved south through the area by winds and currents. It is impossible to predict this potential impact with any degree of accuracy; however, historical wind and current data indicate this movement is possible if a spill should occur.

AREAS OUTSIDE THE SALE AREA

No pipelines or platforms are expected in any area outside the sale area from the proposed sale. Therefore, no sediment resuspension is expected in any area outside the sale area from oil and gas activities associated with the proposed sale.

No muds or cuttings are expected to be discharged in any area outside the sale area from OCS oil and gas activities associated with this sale. Muds and cuttings discharged within the sale area are not expected to cause impacts in any area outside the sale area. The possible exception is muds and cuttings discharged within 1,000 m of the northern or southern limits of the sale leading to very local impacts up to 1,000 m outside the sale area. However this latter is not expected.

No formation water is expected to be discharged in any area outside the sale area from oil and gas activities associated with this sale. Formation water discharged within the sale area could affect water quality in the immediate (within 3 miles) areas to the north or south of the sale area if formation water discharges should occur within 5-10 km of these sale area borders. This latter case is expected in the southern portion of the sale area where formation water from production may move into the area south of Point Conception. The concentration of formation water (and associated trace metals and hydrocarbons) is expected to be very low in any area outside the sale area.

Accidental discharges of crude oil associated with the proposed action are not expected in areas outside the sale area with the minor exception of a very small probability of spills due to tankering occurring outside the sale area. No oil spills greater than 1,000 barrels are expected in the Bodega and Santa Cruz Basins as a result of tankering. The impacts from accidentally discharged petroleum hydrocarbons is therefore expected to be very low. If a spill did occur the impact to water quality would be moderate (2-3 orders of magnitude increase in hydrocarbons above ambient) for a period of days to one or two weeks. Oil spilled within the sale area could affect water quality outside the sale area. (See Section IV.A.4.) Accidental discharges of oil in the northern portion of the proposed sale area could degrade water quality in the northern portion of the Santa Maria Basin and spills in the southern portion of the sale area could degrade water quality of the ocean off southern California. The extent of water quality degradation in either area outside the proposed sale area is unknown but would depend on variable currents, winds, and the amount of oil spilled.

ii. Conclusions: Water quality in the immediate vicinity of oil exploration and development activities would be degraded. The degree of impact (degradation) to water quality would be very low to low (see definitions of impact levels in Appendix A) from routine discharge. Impacts to water quality are expected to be moderate in the southern Santa Maria Basin from the one expected oil spill. The short-term effects of OCS activities in the marine environment, except immediately around platforms, should not result in any greater than very low levels of change in water quality parameters (trace metals, hydrocarbons, salinity, temperature, turbidity, pH, etc.).

iii. Cumulative Impacts: Cumulative impacts to water quality in the proposed lease area will come from activities on previously leased federal OCS tracts (Sale 53 and some northern tracts of Sale 48 and 68), tracts being offered for lease by the State of California (Pt. Conception to Pt. Arguello area), municipal sewage discharges (primarily Santa Barbara, Morro Bay, Pismo Beach), boating and shipping traffic, and agricultural runoff (primarily nitrates and phosphates in fertilizers and chlorinated hydrocarbons and organophosphates in pesticides and herbicides).

Table IV.E.1.a-4 gives the cumulative volumes of muds, cuttings, formation water, etc. expected from the already leased tracts (and proposed State of California tracts). The amounts of other materials mentioned previously which are expected to contribute to cumulative water quality impacts are extremely difficult if not impossible to quantify.

The cumulative impact from the activities listed above should not violate EPA regulations, OCS Orders, or State of California Ocean Plan guidelines for the California OCS Region. Water quality would remain good and would not exceed concentration levels set by their limits. The exceptions to high water quality would be within several hundred meters of oil and gas activities (platforms) where discharges of drilling muds and cuttings and formation water are expected to produce very low to low water quality impacts. Oil spills from proposed and existing OCS activities may also produce exceptions to high water quality with moderate level impacts. Similar exceptions to good water quality may be expected in nearshore waters around municipal sewage discharges. The exceptions to good water quality mentioned above from cumulative sources are expected on a localized near platform scale and not over the entire sale area.

Thermal discharges (heated water) associated with conventional (fossil fuel) and nuclear power plants will raise ambient water temperatures in coastal water around these plants. It is not expected that these discharges will combine with thermal discharges used to cool generators on oil and gas platforms to produce any cumulative effects on water quality. Cumulative thermal discharges should not be significant to water quality in the general California OCS Region.

Oil and gas activities in the southern portion of the Santa Maria Basin may result in discharges from platforms combining with agricultural runoff from dairy land and produce a cumulative impact in the Morro Bay area. Nearshore current data is sparse for this region and the potential for the cumulative impact is only indicated by a few surface current drifter studies (Williams, et al., 1981). It is expected that the cumulative impacts from these sources will be very low with the majority of nearshore pollutants coming from agricultural runoff.

TABLE IV.E.1.a-4

PREDICTED CUMULATIVE VOLUMES OF ROUTINE
EFFLUENTS FROM FEDERAL AND STATE OIL AND GAS ACTIVITIES

No. Platforms	Drill Cuttings(BBLs)	Cu. Yds. Sediment Pipeline Burial	Muds to be Dumped(BBLs)	Formation Water (MBBLs)	Sewage (Gal/Day)
21	1,490,940	unknown	1,905,090	481,167	79,800

The cumulative number of oil spills greater than 1,000 barrels in volume expected from this proposal, tankering of imported oil (from Alaska and foreign countries) and existing federal leases is 8 (statistically 7.92 spills). An unknown number of oil spills is expected to occur from development of oil and gas resources in the State of California Tidelands and other vessel traffic. This would add to the cumulative expected total of eight (8) spills.

The impact to water quality of the cumulative spills is expected to be moderate in the region. In the unlikely event that spills occur within a short period (for example, one spill every month or every other month) in the same area, the impacts to water quality could be high with elevated hydrocarbons in the water for more than one year. This would be especially true in shallow nearshore areas where oil could be trapped in sediments and subsequently redissolved in the water column. This latter is not expected to happen.

b. Impact on Ocean Dumping

i. Discussion: Ocean dumping is the disposal of waste material in areas of the ocean which the Environmental Protection Agency (EPA) has designated as suitablefor the various types of waste materials (see Figure III). These waste materials have consisted of substances such as low level radioactive waste obsolete munitions, industrial waste, toxic chemicals, and dredge spoils.

Bottom disturbing activities from offshore activities are the major operations that could potentially disturb toxic or other waste material dumped on the OCS. Dump sites are subject to impact from offshore development only if they are directly contacted. This contact could be from the actual placement of a platform, subsea completion, or pipeline, or could occur from the anchoring or drilling associated with exploration. The impact incurred would depend upon the type of material composing the dump site. (See Appendix A for a listing of the levels of impacts to ocean dumping and their definition).

Low level waste contains on the average less than one curie of activities per cubic foot of material, which allows for "hot spots" where the contamination may be many times the average level (Lipshutz, 1980). A dump site disturbed by OCS activites could result in an increase of the release of the radionuclides into the marine environment. Upon release to the marine environment, the radioactivity can progress up through the food chain with the associated bioaccumulation of the radiation. Strontium-90 has been seen in concentrations as high as 65,000 above background level in clam shells, and cesium-137 concentrations in ducks as high as 2,500 times that of their food (Lipshutz, 1980).

Low level radioactive waste has not been disposed at sea since 1970 (Brown 1971; EPA, 1980) when disposal by shallow land burial became the accepted means of disposal.

Obsolete munitions could cause impact if contacted due to the potential instability of the munitions. Industrial wastes and toxic chemicals could be dispersed through the water column and over the immediate surrounding areas, but would be diluted and become less hazardous with distance from the disturbance.

Dredge spoils if disturbed would have an impact on benthic life in the immediate area of disturbance, and could be similar to that observed from drill cuttings. Impacts of drilling muds and cuttings are discussed in Section IV.A.8.

The exact nature of the low level radioactive waste, munitions, toxic chemicals and other hazardous materials dumped in the area, the amounts dumped, how the material was containerized, the distribution of the material throughout the area, and the potential toxicity of the material is still unknown. Information has been requested from the EPA and the Dep]artment of the Navy to determine possible conflicts with the hazardous dump sites, however, due to lack of precise records as to the dumping history of the area it is uncertain as to whether all the requested information is available.

If a dump site is contacted, the potential impact could range from very low (boundary lines might overlap but operations will not disturb any existing dump sites, or operations will have no conflicts with use of the area as a dump site) to very high (operations would disturb an existing dump site resulting in contamination of the water column over a large area, or operations would prohibit use of the area as a dump site) depending upon the material in the dump site.

PROPOSED SALE AREA

There are three designated dumping areas in the Proposed Sale No. 73. One is a designated low level radioactive waste and military dumping area. The site covers 1,125 square nautical miles and coincides with all or part of tracts 141-143, 156-164, 175-183, 195-203, 214-221, 235-242, 255-261, 275-280, 296-301 and 316-320. Although no low level radioactive waste material was dumped at this site, it must still be assumed that any bottom disturbing activity in this area will have a very high impact.

The exact nature of the material dumped in the area, the amount dumped, how the material was containerized, the distribution of the material throughout the area and the potential toxicity of the material is still unknown. This is due to the lack of records and accessability to the records which do exist as to the dumping history of the area.

The records show that the site has not been used as a dump site since 1969, and that it was never used for low level radioactive waste even though it was designated as able to receive low level waste. Information has been requested from the EPA and the Department of the Navy to determine possible conflicts with the hazardous dump site, and to fill in information gaps.

Based on these facts it must be assumed that a very high impact will occur from any development of this area without the invocation of the Hazardous Waste Stipulation.

The other two dump sites were used only once for dredge spoil material from Morro Bay and as such a very low impact is anticipated even if they are disturbed.

Five platforms, 155 wells and 114 miles of pipeline are anticipated from the sale. The probability of one or more of these disturbances contacting any of the dumping area is low. If a dumping area is not contacted, a very low impact is anticipated to dump sites in the Santa Maria Basin.

AREAS OUTSIDE THE PROPOSED SALE AREA

No impact is expected to dump sites in the Northern portion of the Santa Maria Basin, or in the Southern California Bight as a result of this proposal. This is due to the fact that no bottom disturbing activities would occur in either of these areas as a result of the proposal.

ii. Conclusion. The impacts from hazardous dump sites could be very high if bottom disturbing activities, in the hazardous waste dump site areas, contact the waste containers.

iii. Cumulative Impacts: Impacts to ocean dumping in the region will occur from other projects and existing leases. The expansion at Vandenberg Air Force Base will have a need for an offshore dredge spoil site. The State Tidelands would not impact any sites as no designated sites are in the planning area between Pt. Arguello and Pt. Conception. The existing leases in southern Santa Maria Basin are expected to have a very low impact to the dump sites in the area.

The proposal does not significantly add to the impacts from these sources unless the hazardous waste site off Pt. Arguello is contacted.

c. Air Quality

i. Discussion: Effects of Proposed Sale No. 73 activities on air quality have been estimated through computer simulated models. Calculated air quality levels represent only a reasonable approximation based on probable exploration and development plans, production schedules, and transportation scenarios (see Section II.A.1). Site specific information will not be available until development actually takes place. Prior to a lessee constructing a source resulting in significant pollutant emissions on the OCS, Minerals Management Service (MMS) will perform a detailed air quality analysis and will determine anticipated air quality impacts including cumulative effects from interaction with existing OCS pollution sources. Air pollution controls would then be required by MMS if necessary to prevent significant adverse impacts to onshore air quality (see Section III.A.9 and Appendix H).

Modeled pollutant concentrations were based on a handbook prepared by MMS for estimating air quality impacts from oil and gas developments on the California OCS (Form and Substance, 1983a). This handbook contains in nomograph form results of comprehensive air pollutant dispersion modeling of potential OCS air emissions under a variety of development scenarios, offshore distances, and production rates. A brief overview of the models utilized and general assumptions used is given below. A detailed discussion of the techniques and technical assumptions is presented in the technical background documents (Form and Substance, 1983a and POCS Technical Paper No. 83-2 (FSI,1983b)).

Inert pollutants were modeled using EPA-approved Gaussian diffusion models. Gaussian models can estimate concentrations within a factor of two (the ratio of calculated to actual concentration ranges between 0.5 and 2) when emissions and meteorological inputs are known with high precision. (FSI, 1983b).

Ozone concentrations were calculated using the RAPT (Reactive Air Pollutant Transport) model. RAPT is a model which calculates concentrations of photochemically reactive pollutants along a trajectory determined by the wind flow. The accuracy of the RAPT model is more difficult to evaluate due to the complexity of the many variables involved. The state-of-the-art of photochemical modeling is being updated constantly. Accuracy is limited by imperfect knowledge of the very complex chemistry of reactive pollutants in the atmosphere. However, if the model is carefully applied, it is possible to achieve an accuracy within a factor of two (FSI, 1983b).

MMS has conducted offshore tracer studies at several locations along the California coast to characterize overwater dispersion characteristics. One study was conducted near Ventura (AeroVironment, 1981), and another study was performed near Santa Maria (SRI International, 1983). The study results will be used to improve the accuracy of air quality models used by MMS in OCS impact assessments.

Assumptions were used in the modeling to provide a worst-case analysis. The assumptions result in estimates of reasonably expected upper limits and reduces the likelihood that impacts would be underestimated. A detailed discussion of the methodology and all technical assumptions is presented in POCS Technical Paper No. 83-2 (FSI, 1983b).

The most significant assumptions used in the analysis are summarized below:

- For short-term concentrations, emissions were maximized by assuming simultaneous operation of all possible emission sources.

- Mobile emission sources were treated as originating from a point, rather than being spread along a line.

- Worst-case meteorological conditions including light wind speeds (2 meters per second), direct pollutant transport to shore, and stable atmospheric conditions for short-term average calculations.

- Absorption of NO_x and SO_x by the ocean or land surface was ignored.

- Emission controls on offshore sources were not included in the modeling calculations. Under DOI air quality regulations emission controls can be required as a part of MMS's approval of an exploratory plan or development and production plan.

PROPOSED SALE AREA

Modeling Results

Inert Pollutants - Maximum calculated onshore concentrations of inert pollutant associated with Proposed OCS Sale No. 73 are presented in Tables IV.E.1.c-1 and IV.E.1.c-2. The concentrations are compared with the Department of Interior (DOI) Significance Levels as well as Federal and State Ambient Air Quality Standards (AAQS).

Exploratory Phase. Maximum calculated 1-hour average concentrations from exploratory drilling activities for NO_x, SO_2 and CO are 211, 13, and 38 ug/m^3 respectively and occur in San Luis Obispo County (Table IV.E.1.c-1).

TABLE IV.E.1.c-1

MAXIMUN PREDICTED ONSHORE SHORT-TERM POLLUTANT CONCENTRATIONS, PROPOSED OCS SALE NO. 73 [1,2]

	Pollutant Concentration (ug/m3)						
	NO_x	SO_2			CO		TSP
Averaging time	1-hr	1-hr	3-hr	24-hr	1-hr	8-hr	24-hr
Exploratory Phase							
San Luis Obispo County	211	13	13	2	38	38	2
Santa Barbara County	172	10	10	1	31	31	1
Development Phase[3]							
San Luis Obispo County	202	14	14	2	40	40	2
Santa Barbara County	115	8	8	1	22	22	1
DOI Significance Level	-	-	25	5	2,000	500	5
Federal AAQS	-	-	1300	365	40,000	10,000	260
California AAQS	470	1310	-	131	23,000	10,000	100
Maximum Observed Air Quality Level[4]							
San Luis Obispo County	206[5]	209[6]	N/A[7]	63[6]	11,429[5]	7,500[5]	102[6]
Santa Barbara County	75[8]	104[9]	N/A[7]	31[9]	17,142[10]	9,900[10]	121

1. Based on air quality analysis by Form and Substance (1983 a,b)
2. Calculations made for the expolratory and development phases only. For the production phase, concentrations would be lower than for the development phase
3. Concentrations are for the peak development year (1989)
4. Maximum observed air quality levels were obtained from the monitoring station nearest the location of maximum calculated concentrations. Monotoring data obtained from CARB and are for the year 1981.
5. Recorded at San Luis Obispo.
6. Recorded at Morro Bay.
7. N/A indicates monitoring data for this averaging period were not available.
8. Recorded at Santa Maria. 9. Recorded at Lompoc. 10. Recorded at Santa Barbara.

TABLE IV.E.1.c-2

MAXIMUM PREDICTED ONSHORE ANNUAL AVERAGE POLLUTANT CONCENTRATIONS, PROPOSED OCS SALE NO. 73[1,2]

	Pollutant Concentration (ug/m^3)			
	NO_x	SO_2	CO	TSP
Development Phase[3]				
San Luis Obispo County	0.35	0.01	0.19	0.02
Santa Barbara County	0.86	0.05	0.49	0.05
Production Phase[4]				
San Luis Obispo County	0.38	Neg.[5]	0.21	0.01
Santa Barbara County	0.13	Neg.	0.08	0.01
DOI Significance Level	1	1	-	1
Federal AAQS	100	80	-	60
California AAQS	-	-	-	60
Maximum Observed Air Quality Levels[6]				
San Luis Obispo County	13[7]	3[7]	N/A[8]	58[7]
Santa Barbara County	17[9]	3[10]	N/A[8]	63[10]

1. Based on air quality analysis by Form and Substance (1983 a,b)

2. Calculations made for the development and production phases only. For the exploratory phase, concentrations would be lower than for the development phase.

3. Concentrations are for the peak development year (1989).

4. Concentrations are for the peak production year (1993).

5. Negligible indicates concentrations less than 0.01 ug/m^3.

6. Maximum observed air quality levels were obtained from monitoring station nearest the location of maximum calculated concentrations. Monitoring data obtained from CARB and are for the year 1981.

7. Monitored at Morro Bay.

8. N/A indicates monitoring data for this averaging period were not available.

9. Monitored at Santa Maria.

10. Monitored at Lompoc.

Pollution levels for Santa Barbara County are slightly lower because exploratory activities would take place at a somewhat larger distance from shore. The California AAQS for 1-hour average NO_2 concentrations is 470 ug/m^3. The maximum observed 1-hour average NO_2 concentration at Morro Bay was 206 ug/m^3. Predicted NO_2 concentrations added to maximum observed levels are below the California AAQS.

Maximum concentrations of SO_2, CO, and TSP are well below the DOI Significance Levels. The maximum 3-hour SO_2 concentration is 52 percent of the DOI Significance Level; the maximum 8-hour CO concentration is only 8 percent of the DOI Significance Level. Maximum 24-hour TSP concentrations are 40 percent of the DOI Significance Levels.

Annual average concentrations were not calculated. Exploratory drilling generally lasts a maximum of 45 to 90 days at any one location, and therefore would not contribute significantly to long-term average pollution levels.

Development Phase. Maximum short-term concentrations would occur during platform installation. The modeling results are given in Table IV.E.1.c-1. The highest predicted concentrations occur in San Luis Obispo County. The maximum 1-hour average concentrations for NO_x, SO_2, and CO, are 202, 14, and 40 ug/m^3, respectively. Predicted NO_2 concentrations added to maximum observed concentrations are below California AAQS.

Maximum calculated concentrations of SO_2, CO, and TSP are well below the DOI Significance Levels. The maximum 3-hour SO_2 concentration is 56 percent of the DOI Significance Level. The maximum 24-hour TSP level is 40 percent of the DOI Significance Level. The maximum 8-hour CO concentration is 8 percent of the DOI Significance Level. Predicted concentrations of SO_2 and CO added to existing background levels, would be below Federal and State AAQS. However, existing TSP concentrations exceed the State AAQS, primarily due to fugitive dust. Concentrations from Proposed Sale No. 73 activities would be about 2 percent of existing TSP concentrations.

Maximum calculated annual average pollutant concentrations for the development phase are given in Table IV.E.1.c-2. The maximum NO_2 concentration of 0.86 ug/m^3 for Santa Barbara County is close to the DOI Significance Level of 1 ug/m^3. Concentrations are well below the DOI Significance Levels for all other pollutants. Proposed OCS Sale No. 73 developments would not add significantly to existing pollution concentrations. Existing TSP levels in Santa Barbara County exceed the State and Federal AAQS. However, OCS emissions would be less than 0.1 percent of existing concentrations.

Production Phase. Maximum short-term concentrations were not calculated for for the production phase. However, concentrations are expected to be lower than during the development phase. During the production phase, emissions would be more constant with time and high short-term emission rates associated with development would not occur.

Maximum annual average pollutant concentrations for the production phase are given in Table IV.E.1.c-2. Highest calculated concentrations occur in San Luis Obispo County. The maximum annual average NO_x concentration is 0.38 ug/m^3. This is below the DOI Significance Level. Concentrations for all other pollutants were considerably lower.

Tankering activities at Gaviota would cause maximum annual average concentrations of NO_x, SO_2, and TSP of 1.15, 0.08, and 0.09 ug/m^3, respectively. The NO_x concentration is only 1 percent of the Federal AAQS. The pollutant concentrations would not contribute significantly to existing levels.

Ozone - Trajectory modeling to calculate impacts from ozone (O_3) was performed by first establishing a baseline level (without Proposed Sale No. 73 sources). Estimated future onshore emissions were obtained from local Air Pollution Control Districts. The model was run using these data to establish the future baseline level. The same trajectory was then run including emmissions from Proposed Sale No. 73 developments. The ozone increment was then determined by calculating the difference in ozone levels for the two model runs at each point along the trajectory.

Modeling was performed with trajectory endpoints at Nipomo, Santa Ynez and Goleta. The results are shown in Table IV.E.1.c-3. A range of O_3 values is shown, since a given trajectory was selected so that it could traverse any number of platforms. The maximum O_3 values for the Nipomo trajectory exceed the national standard of 12 parts per hundred million (pphm), while the maximum O_3 values for the Santa Ynez trajectory exceed the California standard of 10 pphm. Maximum O_3 increments from proposed Lease Sale No. 73 activities range from 0.5 to 2 pphm.

San Luis Obispo County is presently in attainment of the national O_3 standards. The California standard is violated on one or two days per year at Nipomo. Maximum O_3 concentrations were 10 pphm in each of the years 1979 through 1981. An increase of 0.5 to 2 pphm above existing levels could cause an increase in the number of violations of the California standard, and could bring O_3 levels close to the national standard.

Santa Barbara County is presently nonattainment for O_3. However, the western portion of the APCD, which includes Santa Maria, Lompoc, and Santa Ynez has not experienced any exceedences of the national O_3 standard in the years 1979 through 1981. However, the California O_3 standard is exceeded on one or two days per year in Santa Maria and Santa Ynez. An increase of 0.5 to 2 pphm above existing levels could cause an increase in the number of violations of the California standard, and could bring O_3 levels close to the national standard.

Proposed Lease Sale No. 73 would therefore have the potential of causing low to moderate air quality impacts to San Luis Obispo and Santa Barbara counties because O_3 levels may increase to levels approaching federal standards (see definitions in Appendix A).

In the event that an OCS source may cause a violation of federal air quality standards, DOI air quality regulations provide for a review process designed to prevent such an occurrence. More details on the review process and mitigation requirements are given in Appendix H. A discussion of potential mitigating measures is given in Appendix O.

Visibility. Calculations were also made to assess potential effects on atmospheric visibility. Atmospheric visibility was defined in terms of visual range (the farthest distance at which a black object can be perceived against the horizon). The model assumed light wind speeds, stable atmospheric conditions, and a background visual range of 15 km (9.4 miles). The maximum reduction in visual range varied from 1.5 to 3.3 percent (FSI, 1983b). This would not be a noticeable reduction in visibility, therefore no significant impact on visibility would be expected.

Table IV.E.1.c-3

MAXIMUM ONSHORE OZONE CONCENTRATIONS FROM PROPOSED OCS SALE NO. 73[1]

Trajectory	Ozone Baseline (pphm) at the Trajectory End Point: Present	Ozone Baseline (pphm) at the Trajectory End Point: Future	Ozone Concentrations at the Trajectory Endpoint[2] (pphm): Lease Sale 73	Ozone Concentrations at the Trajectory Endpoint[2] (pphm): Cumulative	Maximum Incremental Onshore shore Ozone Impact[2] (pphm): Lease Sale 73	Maximum Incremental Onshore shore Ozone Impact[2] (pphm): Cumulative
Nipomo[3]	11	12	13-14	13-14	1-2	1-2
Santa Ynez[4]	11	10	10.5-11	11	0.5-1	1
Goleta[5]	4	4	4.5-6	6-9	0.5-2	2-5

1. The values shown in this table are based on photochemical modeling presented in the OCS air quality handbook (FSI, 1983a). The modeling assumes a worst-case scenario where all sources are considered to be clustered in a single point along the trajectory. The location of the sources was selected to produce maximum onshore O_3 increments. All O_3 concentrations are 1-hour averages.

2. A range of O_3 concentrations or increments are shown depending upon the number of platforms along the trajectory. For Lease Sale No. 73 the lowest value considers a single platform; the highest value considers multiple platforms. For the cumulative, lowest value considers one Lease Sale 73 platform and one Lease Sale 53 platform.

3. For the Nipomo trajectory, maximum Lease Sale 73 value is for two Lease Sale 73 platforms. No additional platforms are considered in the cumulative case.

4. For the Santa Ynez trajectory, maximum Lease Sale 73 value is for two Lease Sale 73 platforms. Maximum cumulative value is for two Lease Sale 73 platforms and one Lease Sale 53 platform.

5. For the Goleta trajectory, maximum Lease Sale 73 value is for three Lease Sale 73 platforms. Maximum cumulative value is for three Lease Sale platforms and two existing facilities in the Santa Barbara Channel.

AREAS OUTSIDE THE PROPOSED SALE AREA

No significant air quality impacts are anticipated for areas north of San Luis Obispo county. Emissions from tanker transit between the proposed lease sale area and the San Francisco Bay would be too small to affect onshore areas. Prevailing winds are unfavorable for carrying emissions from the proposed sale area to coastal areas north of Morro Bay.

Projected increments for inert pollutants for the coastal areas adjacent to the Santa Barbara Channel would be smaller than those calculated for the proposed sale area because of the increased dilution of pollutants with distance from the source.

Ozone calculations were made along a trajectory starting over OCS waters off Point Conception, passing through the Santa Barbara Channel, and terminating at Goleta. The maximum increase in ozone was 2 pphm. The baseline level at Goleta was quite low (4 pphm). Goleta normally experiences violations of the Federal AAQS several times a year. However, meteorological conditions that would be associated with transport of pollutants from the Santa Maria Basin involves a long trajectory almost entirely over water, and under these conditions background ozone levels would be very low. Proposed Sale No. 73 activities would therefore cause no significant impacts to ozone levels in the Santa Barbara Channel area. Overall impacts for the area would be low (insignificant increase in air quality concentrations within a nonattainment area).

No air quality impacts are predicted from refineries. Refineries in the San Francisco Bay area and in the Los Angeles Basin that would process crude oil from Lease Sale No. 73 would have to undergo extensive modifications because the crude oil is expected to have a higher sulphur and trace metal content than crude oil being refined presently. Air emissions would be regulated by the State and the local air pollution control agencies. It is anticipated that no increase in air emissions would result. For impacts on refineries see Section IV.E.3.m.

ii. Conclusion: Proposed Sale No. 73 would cause a small increase in concentrations of inert pollutants (NO_x, SO_2, CO and TSP). There would be a potential of a small increase in O_3 concentrations. This may aggravate violations of the State standard for O_3, and could result in maximum O_3 levels close to the federal standards. Air quality impacts from increased O_3 levels would be low to moderate (see definitions in Appendix A).

iii. Cumulative Impacts:

Cumulative air quality impacts were predicted by considering estimated air emissions from Proposed Lease Sale No. 73, existing Lease Sales No. 53 and RS-2, existing lease sales in the Santa Barbara Channel, proposed and existing lease sales in State tideland waters, and estimated future emissions from all onshore sources.

Existing offshore sources of air emissions consist of tanker transit, local boat traffic, exploratory drilling operations associated with existing OCS leases, and support vessel operations associated with OCS activities. Impacts from offshore tanker transit on onshore areas would be insignificant and were not considered further in the analysis. Emissions from future expected drilling operations and associated support vessel activity associated with existing OCS Leases were included in the cumulative analysis.

Onshore emissions from future OCS activities associated with existing leases include oil and gas processing facilities. These are expected to cause localized concentrations of pollutants such as SO_2 and NO_x No modeling was performed, since exact emissions could not be quantified as they would be dependent upon local air quality regulations.

Future emissions from onshore non-OCS sources include emissions associated with general population growth, increased vehicular traffic, and specific projects such as expansion of Vandenberg Air Force Base. In the photochemical modeling, future onshore emission estimates were obtained from the local Air Pollution Control Districts. For the inert modeling, future onshore emission sources were not modeled individually. Baseline air quality levels were obtained from existing monitoring data. It was assumed future baseline levels for inert pollutants would not change significantly from existing levels. Future non-OCS projects such as the proposed expansion of Vandenberg Air Force Base would be expected to cause localized air quality impacts, but should not significantly change the overall future baseline level for the area.

It must be noted that cumulative concentrations are difficult to predict. Impacts from platform emissions are very localized and cumulative interactions among several facilities depend greatly upon the locations of the individual platforms and their relative proximity to each other. In the absence of site-specific information, a worst-case analysis was assumed with respect to potential location of future OCS sources.

Cumulative impacts are summarized below:

Inert Pollutants: Cumulative air quality impacts associated with inert pollutants are shown in Table IV E.1.c-4. The table shows a comparison of predicted cumulative increments and increments associated with proposed Lease Sale No. 73 alone. In the case of San Luis Obispo County, the values are identical because no significant emission sources would be associated with existing OCS leases. For Santa Barbara County, cumulative increments are somewhat higher than Lease Sale No. 73 increments because of production platforms anticipated to result from Lease Sales No. 53 and RS-2.

The maximum 1-hour average NO_x concentration from OCS activities is 0.98 ug/m^3 (the DOI Significance Level is 1 ug/m^3). Best available control technology (BACT) would be required on NO_x sources if the DOI Significance Level would be exceeded. Concentrations for all other pollutants as discussed below would be well below DOI Significance Levels. The maximum 3-hour, 24-hour, and annual average SO_2 concentrations are 14, 2, and 0.53 ug/m^3, respectively. (The corresponding DOI Significance Levels are 25, 5, and 1 ug/m^3, respectively.) The maximum 8-hour average CO concentration is 40 ug/m^3. (The DOI Significance Level is 500 ug/m^3.) The maximum 24-hour and annual average TSP concentrations are 2 and 0.10 ug/m^3, respectively. (The corresponding DOI Significance Levels are 5 and 1 ug/m^3, respectively.)

Maximum predicted onshore concentrations from cumulative OCS development added to background pollutant concentrations are given in Table IV.E.1-4.

Cumulative OCS development would result in the following changes in maximum onshore air pollutant concentrations:

The maximum 1-hour average NO_2 concentration would increase from its present value of 206 ug/m^3 to a future predicted value of 408 ug/m^3. The future predicted value is below the California ambient standard (470 ug/m^3). The maximum annual average NO_2 concentration would increase from 17 ug/m^3 to 18 ug/m^3. (The national ambient standard is 100 ug/m^3.)

The maximum 1-hour average SO_2 concentration would increase from its present background value of 209 ug/m^3 to a future predicted value of 223 ug/m^3. (The California ambient standard is 1310 ug/m^3.) The maximum annual average SO_2 concentration would increase from its present background value of 3 ug/m^3 to a future predicted value of 4 ug/m^3 (The national ambient standard is 80 ug/m^3.)

The maximum 8-hour average CO concentration would increase from its present background value of 9,900 ug/m^3 to a future predicted value of 9,933 ug/m^3. (The national and State ambient standard is 10,000 ug/m^3.)

The maximum 24-hour average TSP concentration would increase from its present background value of 121 ug/m^3 to a future predicted value of 122 ug/m^3. These values exceed the State standard of 100 ug/m^3, but are below the national secondary standard of 150 ug/m^3. The increase would be less than 1 percent of existing background levels, and is considered to be insignificant according to the DOI air quality regulations.

All future predicted levels would be below national and State ambient standards for all polutants, except for TSP. OCS emission sources would contribute an insignificant amount to TSP concentrations. Overall impacts from inert pollutants associated with all OCS activities would be very low to low as pollution levels for the area would not change significantly from baseline values (see definitions in Appendix A)

Ozone. Cumulative ozone impacts are shown in Table IV E.1.c-3. The cumulative values include emissions from all anticipated future OCS activities and all expected future onshore emission sources. The maximum predicted increase in O_3 levels for the proposed sale area from OCS activities ranges from 1 to 2 pphm (as predicted by the Nipomo and Santa Ynez trajectories). Present O_3 levels in the impact area do not exceed the national standard, but the State standard is violated on one or two days per year. An increase of 1 to 2 pphm could result in O_3 concentrations close to the National standard.

In the event that an OCS source may cause a violation of federal air quality standards, DOI air quality regulations provide for a review process designed to prevent such an occurrence. More details on the review process and mitigation requirements are given in Appendix H. A discussion of potential mitigating measures is given in Appendix O.

The cumulative ozone analysis indicated moderate air quality impacts are possible due to an increase in O_3 concentrations by 1 to 2 pphm. This could cause an increase in the number of violations of the State standards and would result in O_3 concentrations close to the national standard.

TABLE IV.E.1.c-4

MAXIMUM PREDICTED ONSHORE CUMULATIVE POLLUTANT CONCENTRATIONS DEVELOPMENT PHASE[1]

	Pollutant Concentration (ug/m^3)									
	NO_x		SO_2				CO		TSP	
Averaging Time	1-hr	Annual Avg.	1-hr	3-hr	24-hr	Annual Avg.	1-hr	8-hr	24-hr	Annual Avg.
Maximum Predicted Concentrations (OCS sources only)										
San Luis Obispo County										
Lease Sale 73	202	0.33	14	14	2	0.18	40	40	2	0.02
Cumulative	202	0.33	14	14	2	0.18	40	40	2	0.02
Santa Barbara County										
Lease Sale 73	115	0.86	8	8	1	0.49	22	22	1	0.05
Cumulative	130	0.98	8	8	1	0.53	33	33	1	0.10
DOI Significance Level	-	1	-	25	5	1	2,000	500	5	1
Maximum Background Concentrations (without OCS sources)										
San Luis Obispo County	206[3]	13[4]	209[4]	N/A[5]	63[4]	3[4]	11,429[3]	7,500[3]	102[4]	58
Santa Barbara County	75[6]	17[7]	104[7]	N/A[5]	31[7]	3[7]	17,142[8]	9,900[8]	121[7]	63
Maximum Predicted Concentrations (background concentrations added to cumulative OCS concentrations)										
San Luis Obispo County	408[9]	13	223	N/A[5]	65	3	11,469	7,540	104	58
Santa Barbara County	205[9]	18	112	N/A[5]	32	4	17,175	9,933	122	63
National AAQS	-	100	-	1300	365	80	40,000	10,000	260/150[2]	75/60[2]
California AAQS	470	-	1310	-	131	-	23,000	10,000	100	60

Source: POCS Technical Paper No. 83-2 (FSI, 1983b)

1. Annual average concentrations are for the peak development year (1989).
2. National Primary/National Secondary Standard.
3. Recorded at San Luis Obispo.
4. Recorded at Morro Bay.
5. N/A indicates monitoring data for this averaging period were not available.
6. Recorded at Santa Maria.
7. Recorded at Lompoc.
8. Recorded at Santa Barbara.
9. Based on the assumption that all NO_x would be in the form of NO_2.

2. Biological Environment

a. Impact on Intertidal Benthos

i. Discussion: As discussed in Section II.B.2, the intertidal shorelines of central-northern California are made up of approximately 50 percent rocky shore and 50 percent sandy beach (Visual No. 5 in BLM, 1980). The rocky and boulder intertidal beaches of central-northern California support a very diverse and abundant assemblage of invertebrates, seaweeds, and marine plants. Populations of sandy beach organisms are sparse in comparison with rocky shore populations. Most of the intertidal shorelines of the study area receive relatively little human usage, largely due to limited access. As a result of this low level of human activity, many of the intertidal habitats support undisturbed, natural communities.

Oil spills from platforms or tankers and the movement of equipment during installation of pipelines at landfall locations could cause impacts to intertidal shorelines. Routine operations of drilling platforms and related activities are not expected to cause impacts to intertidal communities, all of which are 3 or more miles away. Further analysis of oil development impacts on intertidal areas can be found in Section IV.A.8.b, BLM (1975, 1979, and 1980) and National Academy of Science (1975).

<u>Oil Spills - Rocky Intertidal</u>. Offshore oil and gas activities sometimes result in an accidental release of oil. Based on the Oil Spill Risk Analysis Model, one spill greater than 1,000 bbl is expected to occur as the result of oil activities in the proposed sale area. No oil spills are expected for the northern Santa Maria Basin, where no tracts will be leased (see Section IV. A.4 for a further discussion of the Oil Spill Model). In addition, several small spills of less than 1,000 bbls may occur in the proposed lease sale area. These are, however, not predictable from the Oil Spill Model.

Impacts from a large oil spill include death of rocky shore intertidal organisms from primarily smothering, although toxic related mortality is also possible, particularly if oil reaches shore in a matter of hours.

The 1969 Santa Barbara oil spill (77,000 bbl*) is the best example of a platform oil spill available to estimate impacts in the proposed sale area in terms of similarity of organisms, habitat, geographical location and type of oil. Chan (1972, 1973, and 1977) conducted a thorough study on Duxbury Reef, near a San Francisco oil spill. The impact from that spill however, was due to a refined Bunker C oil. Refined oil is typically more toxic than crude oil.

Since the oil spill model used in this EIS defines large spills as those greater than or equal to 1,000 bbl, the probability of an intertidal area actually being contacted by a spill that might cover an area as extensive as the Santa Barbara spill would be less than this open ended spill category. The potential impacts caused by a large ($\geq$ 1000 barrels) spill for the majority of intertidal areas

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*Allen, A.A., 1969, Testimony before the Subcommittee on Minerals, Materials, and Fuels of the Committee on Interior and Insular Affairs, United States Senate, 91st Congress, May 19-20, 1969.

will be lower than the moderate impacts that occurred during the very large (≥ 10,000 barrels) Santa Barbara spill (Straughan, 1971; Foster, et al., 1971). The impacts caused by a spill to certain rocky intertidal areas believed to be sensitive (Table III.B.1-1), however, would be the same or possibly greater than those during the Santa Barbara spill.

During the 1969 Santa Barbara oil spill, certain species experienced 100 percent mortality, while other species were harmed only slightly, or were apparently unharmed (Straughan, 1971; Foster, 1974; Foster, et al., 1971). The extent of damage from oil spills depends largely on the residence time of the oil in the intertidal area (Hayes and Grundlach, 1979). Residence time on steeply inclined intertidal areas will be brief and impacts consequently should be low (a short-term insignificant interference with ecological relationships lasting less than a year). Broad flat intertidal surfaces could retain oil for several days. The length of residence time on flat or gently sloping intertidal surfaces will depend upon tidal height and whether or not the oil is moved away from the impacted area during high tide cycles. Oil on flat broad intertidal platforms and shallow tide pools will usually cause moderate impacts (significant interference with ecological relationships that will last for less than 2 years).

The length of the recovery period of the damaged intertidal communities to a pre-disturbance condition will depend upon the vertical level of the intertidal zone affected (Murray and Littler, 1979, 1980). The upper barnacle zone should require the least time to recover (approximately 1 year). The more structurally-complex middle and lower-levels would require the greatest time for recovery. These structurally complex communities are mature communities which have been established for a fairly long time and have many species which live for long periods. The life expectancies of only a few species have been reported in the literature (Vesco and Gillard, 1980). The majority of macroinvertebrates which have been investigated have life potentials of over 5 years. In the lower tidal communities interrelationships have become established which are thought to be the primary factor controlling the composition of the community (Carefoot, 1977). Such communities require a long time to recover if they are severely altered. Recovery time for communities within these areas will vary from over 1 year for certain seaweeds, up to 10 years for a mussel bed. However, mussels communities have not suffered apparent significant mortality during oil spills (Chan, 1975).

Most rocky intertidal areas would be expected to begin recovery within a year after the disturbance, and reproductive maturity achieved within 5 years. Isolated locations which have been heavily affected could be retarded in recovery for possibly a year because larvae and spores from impacted species would have to come from areas outside the impacted area rather than from within it. This condition is particularly true of the brown algae which have limited dispersal abilities. Once repopulation commences, recovery would proceed normally, although other dominant species could outcompete the original species as a result of advantageous settling times.

Table III.B.1-1 lists rocky intertidal areas in Central California which are believed to be more sensitive to oil spill impacts than other areas of the coast. The selection of these areas was based upon their having broad flat rocky platforms, isolation from other rocky intertidal areas, biogeographic location, and potential or past scientific study history (see Section III.B.2).

The impacts on the areas listed in Table III.B.1-1 are expected to be moderate from a large oil spill. On Duxbury Reef/Agate Reef, which is outside the sale area, prolonged exposure to oil would cause a high impact (a significant alteration of ecological relationships which lasts over 2 years).

In the event of multiple spills hitting the same area before reproductive recovery has been obtained, high ecological losses to rocky intertidal areas could occur. The greatest long-term impacts to rocky intertidal communities would result from several large oil spills hitting the same area every few years before recovery is complete. The oil spill model, however, predicts only one spill for the entire sale area, so multiple spills are not expected.

The time for recovery from a high ecological loss would not be the same in all areas listed on Table III.B.1-1. Some areas in Central California are isolated to some extent from other rocky intertidal areas and would probably take longer to recover than areas not isolated. Normally, recovery would be expected to begin within a year, reproductive capacity achieved within 5 years, and the community returning to pre-disturbance structure within 10 years. These periods are based upon intertidal dominants having long reproductive recovery rates. According to Vesco and Gillard (1980), many of the intertidal species of the California coast reach sexual maturity within 2 years, while community recovery periods vary from 1 to over 10 years depending upon geographic location and the vertical level within the intertidal area. At isolated areas, commencement of recovery could be delayed for approximately a year. Two areas, Point Arguello and Point Conception, are also near or at the dividing line of the Oregonian and California Biological Provinces (Valentine, 1966; Newman, 1979). More invertebrates have their entire geographic range restricted to this general area, including the Santa Barbara Channel, than anywhere else on the coast.

<u>Oil Spills - Sandy Beach Intertidal</u>. The impacts on sandy beach intertidal assemblages at areas of high wave energy, typical of the central-northern coast, have not been as high as on rocky shore intertidal communities. Impacts on the former from a large oil spill are typically expected to be low. However, if the wave energy is low, residence time of oil on sandy beaches can be longer than on rocky shores. If oil is retained on a sandy intertidal beach for long periods, community members, such as clams, may suffer a high ecological loss. Indirect damage could result from the cleanup operations following a large oil spill. These activities could result in the total destruction of sandy beach communities locally where clean up activities occur. Recovery would probably occur normally, but would have to come from larvae and emigration from surrounding areas.

The extent of impacts resulting from chronic oil pollution are not well known. However, it is doubtful that a rocky or sandy intertidal area would receive significantly prolonged exposure from chronic effluents or several small spills (Section IV.A.4) to cause significant impacts. The distance of three or more miles from platforms to shore, would allow dilution and weathering of the small amounts of oil that might remain to reach shore to become both less toxic and less concentrated. Variable currents and wind patterns would prevent most intertidal areas from receiving chronic oil pollution consistently. Impacts are not expected to exceed the low level.

Pipeline Installation. Local impacts on rocky and sandy intertidal shorelines could also result from the installation of subsea pipelines. During installation, damage to the communities within an area about 20 m wide would occur where the pipelines come ashore. Such damage would result from digging trenches, blasting through rocky intertidal areas or from equipment used on the habitats. Recovery from this type of disturbance should proceed normally. Such impact is considered to be moderate to the small area involved.

PROPOSED SALE AREA

Impacts within the Proposed Sale area are expected to be low.

Oil Spills - Rocky Intertidal. Although one large oil spill is predicted for the Proposed Sale Area, the probability of it reaching an intertidal area is low (7 percent or less) and therefore not expected. Since no oil spills are expected to contact an intertidal area in this area, significant impacts are not expected. However, if a large oil spill were to contact a sensitive rocky intertidal area (Table III.B.1-1), the potential impacts are discussed below.

The sensitive rocky intertidal areas of the proposed sale area can be divided into two areas. The first area within the Santa Maria Basin considered sensitive is the area beginning just north of Spooner Cove and extending to Point San Luis. According to Burge and Schultz (1973) repopulation comes entirely from within this area of coastline. The potential impact from a large oil spill to this area is moderate, although a high impact cannot be completely discounted. It is unlikely that a large oil spill would wipe out the intertidal communities of this entire area of coast. Repopulation would come from within this coastal segment.

The second area contains somewhat isolated areas (Pirate's Cove through Point Conception) with the last three on the list being the most critical. Point Conception is the dividing line between the Oregonian and Californian Biogeographical Provinces. These isolated intertidal areas are consequently in a transition zone assembly having endemic species as well as the southern and northern limits to the distribution of other species (Section III.B.1). Although the impacts from a large oil spill will most likely be moderate to the intertidal community in general, certain endemic species may be eliminated from a critical portion of their habitat or become extinct. The knowledge of the geographic range, sensitivities and identification of endemic species within these areas is not well enough known to predict their potential impact. As with other areas, a high impact to these communities cannot be completely discounted.

Oil Spills - Sandy Beach Intertidal. Since no oil spills are expected to contact an intertidal area in this area, significant impacts are not expected. However, if a large oil spill were to contact a sandy beach intertidal area, the potential impacts are discussed below. Impacts from a large oil to sandy beach intertidal communities in the Santa Maria Basin would usually be low. The high wave energy typical of this area of the coast would prevent long retention periods of oil on the beach. According to the U.S. Naval Weather Service Detachment (1976), waves over five feet occur 50 to 60 percent of the time. However, if the wave energy is low, residence time of oil on sandy beaches can be longer than on rocky shores. If oil is retained on a sandy intertidal beach for long periods, community members, such as Pismo clams, may suffer a high ecological loss. An exception to the most likely low oil spill related impact may be the Pismo Beach region which has several areas supporting large pismo clams (Section III.B.1). A large oil spill striking this area may cause a moderate to high ecological impact to the pismo clam population. The incidence of heavy surge around Pismo Beach is apparently not as frequent as in the northern part of the State (see Table IV.E.2.g-1). The decreased heavy surge would allow oil to remain within the sediments longer increasing the possibility of a high ecological loss of pismo clams if hit by a large spill.

Of particular interest are the Nipomo Dunes which have a large number of endemic species. These species are located in the dunes above the high tide line and probably would receive little impact from oil spills. However, the cleanup equipment used to clean up oil stranded on the beaches could cause high to very high impacts (cause a species or assemblage to become endangered or extinct) to some of these species.

Pipeline Construction. According to the transportation scenario, a pipeline would go ashore north of Santa Maria and near Point Conception. A 20-meter wide disturbance would occur for the length of the pipeline. This impact would to be moderate at Point Conception but may be increased to high for some of the endemic species in the dunes, since the pipeline is projected to cross a section of the Nipomo Dunes. Dune plants requiring disturbed conditions may be benefited.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. Significant impacts from oil spills are not expected, since no large oil spills are predicted from tankering.

Oil Spills - Rocky Intertidal. Should a large spill occur due to tankering and contact sensitive intertidal areas, the impacts would be as discussed below.

The sensitive rocky intertidal areas (Table III.B.1-1) include the Point Reyes Headlands which possesses abundant flora and fauna, particularly the mollusk populations. The potential impact for this area, should it be hit by a large oil spill, is moderate.

The second rocky intertidal area is the Agate Beach-Duxbury Reef. It is a broad extensive flat intertidal platform and is somewhat isolated from other rocky intertidal areas and potential brood stock. Because of the extensive flatness of these platforms, the potential of a high ecological loss resulting from a large oil spill is probably the highest of all areas in central-northern California.

The regional impact from a large tanker spill for the Bodega area should be low. Other rocky intertidal areas, in addition to those classified as sensitive, are present in the region. This is particularly true of the coastline north of San Francisco Bay to nearly Bolinas Lagoon. A large spill is not expected to cover the entire rocky intertidal areas within the basin.

If a large oil spill were to occur and contact sensitive intertidal in the Santa Cruz area, impacts would be moderate to high. Sensitive areas include James Fitzgerald Marine Reserve through Pillar Point, Ano Nuevo Island, the Monterey Peninsula and Carmel River State Beach to Soberanes Point, including Point Lobos Reserve. The final sensitive rocky intertidal area in the Santa Cruz Basin is the Farallon Islands. Their isolation caused them to be placed on the sensitive list. Although a large oil spill would probably cause a low to moderate impact, recovery could be greatly retarded because of the island's isolation from brood stock.

Sensitive rocky intertidal areas within the northern Santa Maria area include Piedras Blancas Point and Cayucos to San Simeon Point. The potential impact to these areas from a large spill is moderate although a high impact cannot be completely discounted. Since this stretch of rocky intertidal is continuous, recovery should proceed normally.

Oil Spill - Sandy Beach Intertidal. Should a tanker spill occur, impacts to most sandy beach intertidal in Bodega and Santa Cruz areas are expected to be low. However, Woodward-Clyde (1982) list Dillon Beach Harbor and Half Moon Bay as important clam areas. Monterey Bay beaches may be more sensitive. The impact from a large spill in these areas may be moderate.

Southern California. One spill is expected to contact the buffer zone surrounding the northern Channel Islands (probability 0.26 within 30 days). No spills are expected to contact the islands themselves. Therefore, impacts to the intertidal benthos are not expected to be significant. However, should a spill occur and contact the Islands, sensitive intertidal areas would be affected (BLM, 1981). Although the most likely impact from a large oil spill is moderate, the following areas have been identified as strong candidates for high impacts (BLM, 1981): San Nicolas Island (N.W. corner), Santa Barbara Island, Santa Rosa Island (northern shore).

ii. Conclusions: Impacts to Central California intertidal areas would not be expected to occur due to the proposed action. However, if a large oil spill occurred and contacted a sensitive rocky intertidal area impacts could be moderate to high for the oiled intertidal area. Pipeline construction over the Nipomo Dunes could cause high impacts to endemic dune species.

iii. Cumulative Impacts: At present the intertidal communities within the proposed sale area are experiencing localized very low to low impacts from visitor use of the beaches. California Fish and Game (Frey, 1971) regards visitor use as one of the most detrimental impacts to intertidal areas.

Oil spill related impacts from existing and future OCS oil and gas development (OCS lease sales in Southern California, Sale 53 and RS-2 and the proposed 1984 lease offering in Southern California) are not expected. Unknown, but potentially moderate, impacts could occur from State and Tidelands development off Point Arguello.

According to the oil spill model, 3 large oil spills from existing oil and gas development and 4 large oil spills from tankers importing Alaskan and foreign oil are expected to occur. Although these spills would increase the chance that a large oil spill will contact an intertidal habitat, none are expected to contact an intertidal community within the sale area. Consequently, impacts should remain very low and low in isolated intertidal areas within the sale area. Unknown, but potentially locally moderate impacts could come from vessel accidents and the proposed sewage facilities for Vandenberg Air Force Base. Oil spill impacts are expected to occur and contact intertidal areas outside the sale area. Sensitive rocky intertidal areas having probabilities of 25 percent or greater of a spill occurring and contacting them from import tankering and existing activities within 3, 10, and 30 days are shown below:

Intertidal Area	3, 10, 30 Day Oil Spill Probability of Occurrence and Contact		
Point Reyes Headlands	9	25	36
Agate Beach/Duxbury Reef	38	43	43
Fitzgerald Marine Reserve	29	35	35

Based upon this information, we can expect moderate to high impacts to Agate Beach/ Duxbury Reef and possible moderate impacts to the other remaining areas from import tankering and existing activities listed above. Since the oil spill occurrence and contact probabilities for these areas are increased by one percent or less when proposed Sale 73 is also considered, the expected impacts to these intertidal areas will remain the same.

Areas south of the sale area having greater than 25 percent, 10-day occurrence and hit probabilities from import tankering and existing activities, include the Southern California coastline from Point Conception to the Santa Barbara area near Carpinteria.

The northern shores of San Miguel, Santa Rosa, and Santa Cruz Islands have 29, 36, and 38 percent 10-day occurrence and hit probabilities from import tankering and existing activities respectively. The 30-day probabilities range from 40 to 43 percent. The most sensitive of these islands is probably Santa Rosa where a high impact is likely, while the impacts for the other areas would be low to moderate. These impacts from import tankering and existing activities are expected whether the sale is held or not. Moderate or possibly high impacts to some of the endemic species in Nipomo Dunes caused by pipeline construction in Sale 73 could occur to the essentially unaltered dune area. Regional impacts would be low. The impacts to intertidal areas from the incremental change that Sale 73 would add will not cause an increase in the present locally very low and low impacts except for possibly high impacts to some endemic species of Nipomo Dunes along the pipeline route.

b. Impact on Subtidal Benthos

i. Discussion: Little information is available on the bottom communities of the region, but it is reasonable to assume that they are productive and diverse owing to the indirect evidence of abundant upwelling and high fisheries landings. See Section III.B. for a further description of the subtidal benthos.

Activities which may adversely impact subtidal dwelling organisms include: emplacement of drilling platforms, discharge of drill cuttings and muds, pipeline construction, and oil spills. For further information on these impacts in general, refer to Sections IV.A.4.b and IV.A.8.b.

For additional coverage of oil production related impacts on subtidal benthos, refer to BLM (1975, 1979, and 1980).

Impacts from Platforms, Drilling Muds, and Drill Cuttings. Impacts from platforms and drilling muds and cuttings are covered together because they occur together and effect the bottom in the immediate vicinity of the platform. The soft bottom community can be altered for over 100 meters from the edge of the platform (Wolfson et al., 1979) for at least the life of the platform. This is caused by organisms, especially mussels, attached to the platform which grow to large size and eventually fall off, creating a different bottom substrate beneath the platform. The fallen mussels attract large numbers of predators, particularly starfish, to the area. Beyond the mussel pile, the nature of the substrate is changed by the fallout of bits of shells, barnacle tests, hydroid tubes, etc. from the platform community. This favors the development of abnormally large populations of the polychaete worm Diopatra ornata to at least 100 m away from the platform. (Wolfson et al., 1979).

The area affected by drill cuttings will vary slightly with depth and current velocity. The majority of heavy cuttings together with some entrained drilling muds will quickly settle to the bottom, form a pile which may be several feet thick under the platform, and gradually decrease away from it. Within a radius of 100 meters of the platform or rig, benthic organisms can be buried. The sediment composition of the bottom can be altered and impacts to benthic communities can occur. Menzies, et al., (1980) reported small impacts on benthic communities for a distance of 800 meters. As a conservative estimate, we assume the maximum distance for sublethal, but detectable impacts on benthic assemblies from drilling muds is 1,000 meters. There is evidence that mortality would not be caused by toxicity of drilling muds (see Section IV.A.8).

The communities within sediment bottoms probably will recolonize after a period of time; however, this colonization may not be by organisms characteristic of the surrounding area. Recolonization will come both from within the buried sediments and from outside larval settlements. Impacts from drilling muds and drill cuttings are of shorter duration than permanent platforms and are probably of less consequence. However, the impacts occur concurrently at least as long as wells are drilled from the platform.

Additional information on impacts from muds and cuttings are described in Section IV.A.8.b. Moderate impacts, (a significant interference with ecological relationships for less than 2 years) will occur in the immediate vicinity of the platform on the bottoms. However, impacts will probably remain localized and the impact to the generally soft bottom outside the impacted area will be low (short term, lasting less than 1 year, with insignificant interferences with ecological relationships).

Platforms could also alter the assemblages on hard bottoms for a radius of 100 meters. As with soft bottoms, impacts are caused by organisms falling from the platform structure and creating a different bottom surface and assemblage.

The highest impacts from drilling muds and cuttings to hard bottoms will be in those areas where the currents are weak.

If platforms are grouped on hard bottom reefs, the ecology of the entire hard bottom area could be altered, resulting in a high ecological impact. However, this is not expected.

Impact from Pipelines. Pipeline installation may disturb soft bottoms for an area 20 meters wide along their axis. Anchors may also cause a disturbance from being dropped and pulled along the bottom when pipelines are being layed. The disturbance will not be continuous from pipeline to anchor, but will occur at a horizontal distance of 3 to 7 times the depth of the anchor (see Section IV.E.17). Trenches and mounds which apparently can remain for over a year in certain soft bottoms result from this procedure. In bottoms consisting of coarser sediments, like sand, the mounds and trenches probably do not remain as long. Assuming the composition of the bottom sediments remains the same from the pipeline or anchor disturbance, impacts to the soft bottom communities would be low.

Pipelines transversing hard bottoms would cause disturbances of the same dimensions given above for soft bottoms. The impacts to hard bottoms will be moderate to high in the path of the pipeline. Attached organisms will be crushed by the pipelines or anchors and repopulation will have to come primarily from larval settlement.

Impacts from Oil Spills. Impacts from a large oil spill, caused by smothering and toxic fractions of the oil, on soft bottom communities generally would be low. This would be particularly true at deeper bottoms where dilution of the oil would be greater before it reaches the communities on the bottom. There is a possible danger of mortality to more sensitive species, particularly microcrustaceans.

Spies, Davis, and Stuermer (1980) compared the benthic assemblages at a natural oil seep near Santa Barbara with an area away from the seep but within the same assemblage. Benthic population densities were actually larger at the seep area. The difference was thought to be due to trophic enrichment by bacterial growth stimulated by the petroleum at the seeps. Much of the population increase was due to an increase in oligochaete worms which thrived on the bacteria. Most of the dominant species populations were also higher at the seep site. Gammarid amphipods [microcrustaceans], however, had lower population densities at the seep sites.

Some of the smaller shrimp and crablike organisms (microcrustaceans) are reported to be particularly sensitive to oil contamination and would probably be among the first of the benthic organisms to be impacted by an oil spill.

Impacts from oil spills on the subtidal hard bottom communities will generally be low. Although these impacts may be low, the destruction of unusually sensitive species, particularly microcrustaceans, or species endemic to the area is possible, although the likelihood is low. A high impact may occur if a species that has an important community function is destroyed on a particular reef or hard bottom area from an oil spill. The community may be significantly altered until the population of the impacted species is replaced by brood stock from other areas. Until ecological relationships on subtidal hard bottom communities are better understood, the likelihood of such an impact is unknown.

Impacts to the benthic community could be increased if more than one oil spill hits the same area before the benthic community had time to recover from a previous oil spill. Impacts under these circumstances could be raised to moderate or even high. According to the oil spill model, multiple oilings will not occur, since there are less than two spills predicted for the entire sale area.

Little evidence exists that kelp is harmed by oil. Under extremely heavy repeated oilings, the reproductive biology of kelp may be interfered with, but this is speculative. The impact will be the mortality of many canopy associates which range from invertebrates through fish. Particularly susceptible are the microcrustacea, especially mysids. Because of rapid reproductive rates and short life cycle, (North, 1972) the population of most of these associates should return to prespill levels within a year.

If the planktonic stage of benthic invertebrate species happened to correlate with a large oil spill, those species could experience poor survival for the year class in the particular region of the spill. The effect on the ecology of subtidal communities of the region from such an impact is not possible to predict.

It should also be noted that when mechanical oil spill equipment is not effective, dispersants may be used; however, the dispersed oil is generally found in the upper portion of the water column and would not reach bottom communities. The extent of impacts resulting from chronic oil pollution is not well known (see Section IV.A.8.b).

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Platforms, Drilling Cuttings and Drilling Muds. The 5 production platforms, temporary exploratory platforms and their associated drill cuttings and muds and pipelines expected for the Santa Maria Basin would cause moderate to high ecological losses in the immediate vicinity of the platforms, but regional impacts to the basin should be low. However, if wells are drilled or platforms placed on rocky outcrops, high impacts are possible. High impacts would occur if rare or sensitive species with important ecological functions are present. Since the composition of, and function within, these communities is unknown, we cannot predict the most serious impact. However, several platforms in a sensitive area would increase the possibility of a high impact.

The topographic highs, reefs and known rocky outcrops (Graphic No. 2) of concern in the Proposed Sale Area are: the large Santa Lucia Bank, two already leased banks off Santa Maria, and scattered rocky outcrops off Point Arguello. Impacts could be high if drilling occurs on, or if platforms are placed on these rocky outcrops. Several of the areas have been surveyed to varying degrees (Hooks, McCloskey and Associates, 1982; Nekton, 1982; and Dames and Moore, 1982).

As indicated in Section III.B.2 over fifteen apparently new species have resulted from these studies, but no species thought to be sensitive or rare were reported. Due to the paucity of studies on similar habitats in the area, these conclusions may be premature. Some of these species may be rare, endemic or sensitive to oil development. Interrelationships within the community are not well known, in any case.

Oil Spills. According to the oil spill model, one oil spill is expected to occur in the Santa Maria Basin as the result of Proposed Sale No. 73. If the spill should occur and contact a subtidal community, the impacts to hard and soft bottoms would most likely be low. However, a high impact to hard bottoms is possible in circumstances similar to those discussed in the paragraph above.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. Since no drilling or oil spills are expected in Central California, there would be no platform, drilling, or oil spill related impacts. No large tanker oil spills are predicted for the Bodega, Santa Cruz, or northern Santa Maria areas and therefore significant impacts to subtidal communities due to oil spills are not expected. However, if a spill should occur, the most likely impact to both hard and soft bottoms would be low. On hard bottoms, a high impact is possible if rare or very sensitive species with important community functions are present. Since the composition of the community and ecological relationships of its members are unknown, the likelihood of such a high impact is unknown.

Southern California. No drilling is expected in Southern California, from this proposed lease sale and there will be no platform or drilling related impacts.

Oil Spills. Impacts due to the one oil spill expected to contact the Channel Island Marine Sanctuary should be similar to those discussed under the Proposed Sale Area above.

ii. Conclusions: Impacts to the subtidal benthos are expected to be low from oil and gas production activities due to the proposed action. However, high impacts are possible from drilling on rocky outcrops within the proposed sale area. If a large spill occurred and contacted a rocky outcrop community, high impacts would be possible.

iii. Cumulative Impacts: Presently the benthic communities in the Sale 73 area are relatively unaltered. The few small areas which are exceptions to this are the areas in which 13 exploratory wells have been drilled, trawl fishing areas and vessel accident locations. Otherwise, these areas still remain relatively pristine.

Future impacts to benthic communities could come from 1) state and federal offshore oil and gas development, 2) vessel accidents and, 3) possible sewage facilities at Vandenberg Air Force Base. These impacts should be localized and generally moderate.

Presently, there are no development platforms in the Santa Maria Basin. Ten development platforms from Sale 53 are scheduled to be constructed. The State Tidelands development scenario has projected 6 production platforms off Point Arguello. Localized high impacts for a radius of 100 meters and low to moderate impacts for approximately 1,000 meters are expected for subtidal benthic communities around each development platform (see the Proposed Sale Area segment of this Section for further discussion). These impacts are a very small proportion of the region and regional impacts would be low.

The 5 production platforms projected for Sale 73 should cause 5 additional areas of localized impacts, but assuming continued restrictions near rocky bottoms, should not change the relatively unaltered or low impacted sale area.

Since no platforms associated with Sale 73 would be constructed outside the sale area, the proposed sale would cause no incremental change to these areas from platform construction and related impacts.

The 114 miles of pipeline routes projected for Sale 73 would cause low (soft bottoms) and moderate (hard bottoms) impacts for approximately 20 meters along the pipeline route and scattered possible moderate impacts from anchor disturbance at distancees 5 to 7 times the depth of the platforms. These impacts should cause no incremental change to the relatively unaltered benthic communities. Since no pipelines resulting from Sale 73 would be placed outside the sale area, the proposed sale would cause no incremental change to these areas from pipelines.

Oil spill related impacts from existing and future oil and gas development (OCS Lease in Southern California, Sale 53 and RS-2 and proposed 1984 lease offering in Southern California) are not expected to occur to the near shore shallow water benthos. These shallow areas have approximately the same occurrence and hit probabilities as land segments in the adjacent area. An unknown number of spills could occur from State Tidelands development off Point Arguello.

According to the oil spill model 3 large oil spills from existing oil and gas development and 4 large oil spills from tankers importing Alaska and foreign oil are expected to occur. An unknown amount of oil would probably reach benthic communities within the sale area resulting in low impacts (see the Proposed Sale Area segment of this Section for further discussion).

The additional spill predicted to occur as the result of this proposed sale would not increase the low impacts to some benthic areas within the sale area. There are no expected impacts to near shore benthic communities expected from this sale.

Benthic communities outside the sale area are expected to be affected by large oil spills. An unknown amount of oil from import tankering and existing OCS activities may contact offshore benthic communities near San Francisco and in the Santa Barbara Channel. These benthic areas have approximately the same probability of a large oil spill occurrence and contact as adjacent land segments (see Sections IV.A.4.a and IV.E.2.a). Impacts to these shallow water benthic communities would be low. The oil spill occurrence and contact probabilities are increased by one percent or less when proposed Sale 73 is considered. Therefore, the expected cumulative impacts for these areas would remain the same. Ten and 30 day large oil spill occurrence and contact probabilities from existing OCS activities and import tankering on the mainland coast of Southern California east of Point Conception to nearly Carpinteria range between 25 and 43 percent. The 10 and 30 day oil spill contact probabilities for the northern shores of San Nicolas Island, Santa Rosa Island and Santa Cruz Islands range between 29 and 43 percent, from existing OCS activities and import tankering.

Impacts to these shallow water benthic communities are also expected to be low from import tankering and existing activities with a possible moderate impact to communities associated with the upper stories of kelp beds. The oil spill occurrence and contact probabilities for the Channel Islands shallow water benthic communities are increased by a maximum 7 percent or less in the northern waters off San Miguel Island when proposed Sale 73 is considered. Therefore, the expected cumulative impacts for these benthic communities would remain the same. The impacts to subtidal benthic communities within the sale area from the incremental change that Sale 73 would add will increase local cumulative impacts at 5 areas to high around production platforms, low (soft bottoms) to moderate (hard bottoms) along 114 miles of pipeline routes and possibly low at unknown areas from oil spills.

c. Impact on Fish Resources

i. Discussion: Oil spills, manmade structures, routine effluents and discharges, and noise potentially can impact fish populations. The overall significance of these impacts to fish resources will depend on the number of fish populations affected and the magnitude of the impacts to these populations (see definitions of impact levels in Appendix A).

It is important to note that fish populations fluctuate dramatically under existing conditions, and any decrease or increase in the size of fish populations resulting from the proposal probably will be difficult to detect.

It is also important to note that reduction in the population size of one species (invertebrate, fish, mammal or bird) could affect other species in the food web. For example, many species feed on northern anchovies. If the number of anchovies in an area is substantially reduced, their predators may need to switch to another food source, if available, to survive. Consumption of this new food source could affect its population size as well. Conversely, reduction in the number of anchovies means the population size of the species it feeds on could increase. The marine food web is extremely complicated and it is not always possible to assess how significant a reduction in the population size of one species due to the proposal will be to other populations. However, the fact that population sizes are interrelated needs to be recognized.

Many preventative measures already exist to protect fish resources (see Sections II.A.1.e, II.A.1.f, and IV.B). Since decreases in fish populations may occur even with these measures in place (see analysis below), the Offshore Oil Spill Pollution Fund is available to affected parties for compensation (see Sections II.A.1.e and IV.B).

Oil Spills. Offshore oil and gas activities sometimes result in an accidental release of oil. These oil spills potentially can impact fish populations by causing: 1) behavioral changes (e.g., an avoidance reaction, reduction in swimming behavior, or reduction in feeding behavior), 2) physiological changes (e.g., reduction in reproductive output, or other tissue changes), 3) habitat alteration (e.g., oiling of spawning substrate), and 4) destruction or alteration of food sources, and 5) a reduction in fish populations either indirectly as a result of 1, 2, 3, and 4 above or directly as a result of oil toxicity or coating (see discussion in Section IV.A.4.b).

Since oil usually concentrates near the surface or in shallow nearshore areas, fishes that are the most vulnerable to oil spills are those that are concentrated in these areas during a significant part of their life cycle. These fishes include northern anchovy (all life stages), Pacific herring (all life stages) and salmon (juvenile and adult life stages) (see discussion below). Squid (all life stages) also are vulnerable to oil spills. Although many other species have at least one life stage that inhabits the surface layer or shallow nearshore areas, they are not expected to be significantly impacted by oil spills since their egg, larval, juvenile and adult stages are so widely distributed in space or time that it is unlikely oil would contact a significant part of the population. (Also see Section IV.E.2.g concerning estuaries and wetlands.)

Sometimes chemical dispersants are used to spread oil throughout the water column before it impacts birds or reaches shore. If dispersants are used, fish concentrated at the surface would be vulnerable to impacts (from oil or toxic components in the dispersants), but impacts to nearshore species may be reduced.

Manmade Structures. Platforms, subsea completions, subsea pipelines, marine terminals and other manmade structures may be used during various stages of oil and gas activities (see discussion in Section IV.A.5). These structures potentially could have positive and negative effects on fish.

During placement and removal of manmade structures, declines in fish populations could occur since the physical damage to feeding and reproductive habitats (e.g., trenching for pipeline burial), increasing turbidity, or blasting (e.g., to bury pipelines in rocky substrate) can kill fish. During regular operation of platforms, a few fish entrained in the seawater intake systems potentially could be killed. Since these effects would be localized near the structure, and most would be temporary (primarily during placement or removal of the structures), most species are not expected to be significantly affected. However, species which have essential feeding or reproductive habitats concentrated in discrete areas (e.g., petrale sole spawning grounds) potentially could be significantly impacted if a large number of structures are placed in these areas.

The proposal also could have beneficial impacts on fish populations. Production platforms and probably other offshore structures act as artifical reefs that attract fish (Carlisle, et al., 1964; Simpson, 1977). The population sizes of some species (particularly rockfish) may actually be increased by the presence of these reefs. Platforms also could be used for mariculture operations (particularly for growth of mussels). Finally, adverse impacts to commercial and sportfishing operations (see Sections IV.E.3.e and f) could result in less fish being caught allowing fish populations to increase.

Effluents and Discharges. Several types of effluents and discharges, (e.g., drilling muds and cuttings, formation waters, and sewage) are routinely released into the ocean during offshore oil and gas operations (see discussion in Section IV.A.8.a). There are indications that these substances potentially could produce sublethal changes (e.g., tissue changes, reduced growth, reduced reproductive output) or death in some fish populations (see discussion in Section IV.A.8.b). Although the impact that these materials will have on fish populations is not known for certain, it is assumed that these materials will cause sublethal or lethal impacts to a few individual fish (egg, larval, juvenile or adult stages) concentrated near each drillng site. This impact however, is expected to be very localized due to rapid dilution of these substances by ocean water.

Noise. Geophysical vessel operations generate acoustic signals with the use of air guns (or steam, electric-spark, or gas-sleeve sources) to study the geologic structures below the sea floor (see Sections IV.A.6 and IV.A.7). These acoustic signals apparently harm very few if any juvenile or adult fish (Falk and Lawrence, 1973; Weinhold and Weaver, 1973). However, fishermen have expressed concern that geophysical vessel operations are harming egg, larval and juvenile stages, and that the declines in fish populations that could result from this harm will not be apparent for many years. Although not known with certainty, if this type of harm occurs, it is expected to occur only to fish located right next to the acoustic signal. Also, fishermen have reported that after a geophysical vessel passes through an area, they catch fewer, if any, fish. Thus, fishermen are concerned that the acoustic signals may frighten fish and cause them to disperse. Although not known with certainty, this type of behavioral change is expected to be localized and short-term (see discussion on fish frightened by explosives in Rulifson and Schoning, 1963). Therefore, noise from geophysical vessel operations is not expected to significantly harm fish unless, perhaps, a very large number of geophysical vessel operations occur at one time. Based on current limited availability of these vessels, this is very unlikely to occur. However, if a very large number of geophysical vessels are used, a small decrease in fish populations concentrated near these operations could occur. Recovery time would depend on what species are affected. Some species would recover rapidly (1-2 years) while others would recover slowly (at least 4-6 years).

PROPOSED SALE AREA

The proposal is expected to result in very low impacts to fish resources in this area (sublethal and lethal changes insignificant).

Oil Spills. Northern anchovies and Pacific herring are the most vulnerable fish species in the proposed sale area since they are the principal species that concentrate in the surface layer or shallow nearshore areas.

Northern Anchovies. During most of the year, northern anchovies (all life stages) are widely distributed and probably would not be impacted very much by oil spills. However, during April-June large dense schools of anchovies, of up to several hundred tons, may be found during daylight at the surface within 20 miles of the coast. A large oil spill (or many small oil spills) contacting one of these schools could affect their planktonic food supply and could kill enough individuals to cause a small reduction in the population. Since northern anchovies are abundant and reach sexual maturity rapidly, recovery is expected to be rapid, taking 1-2 years.

However, little, if any, reduction in these populations is expected as a result of the proposal since, even though one large oil spill is expected in the proposed sale area, the probability that it will contact one of the large schools of anchovies is very low (see Section IV.A.4.a). Although unlikely, if a large oil spill does contact a large school of anchovies, a small 1-2 year reduction in the northern anchovy population in the proposed sale area could occur. This reduction would not be important to the California population of northern anchovies, since the majority of the population is located in Southern California.

Pacific Herring. During most of the year, Pacific herring (all life stages) are widely distributed and probably would not be impacted very much by oil spills. However, during certain periods of fall, winter and spring, herring move inshore to spawn at Morro Bay and San Luis Obispo Creek. Due to the sensitivity of herring to oil, a large oil spill (or many small oil spills) contacting these areas during spawning could cause a reduction in the population by: 1) contaminating spawning substrate; 2) causing egg or larval mortalities; 3) causing mortality of organisms upon which larval herring feed; and 4) causing adult mortalities. Since adult and larval herring spend a small amount of time in the spawning area, only part of the population would be impacted so the reduction would be expected to be moderate. Since herring spawn several times during their life, recovery is expected to take a few (3-5) years at most.

However, little, if any, reduction in these populations is expected as a result of the proposal since, even though one large oil spill is expected in the proposed sale area, the probability that it will contact one of these herring populations is very low even after 30 days (e.g., 2 percent Morro Bay, 7 percent San Luis Obispo Creek). Although unlikely, if a large oil spill does contact one of these herring populations while it is spawning, a moderate 3-5 year reduction in the Pacific herring population in the proposed sale area could occur. This reduction would not be important to the California population of Pacific herring, since the major spawning areas for this species are located north of the proposed sale area at San Francisco Bay and Tomales Bay.

Morro Bay. Several fish species occur in Morro Bay (see Section III.B.3). If a large oil spill contacted this area, significant impacts to the biota could occur (see Section IV.E.2.g). However, no reduction in fish populations in the Bay are expected since the probability of an oil spill occurring and contacting this area is very low (2 percent) even after 30 days.

<u>Manmade Structures</u>. Five platforms and 228 miles of subsea pipelines are expected to be placed in this area. These structures are not expected to cause any significant decrease in fish populations since it is unlikely that enough structures will be placed in any important feeding or reproductive areas to significantly affect any fish populations (see discussion above). Also, these structures are not expected to cause any significant increase in fish populations since it is unlikely they will create enough new habitat or other beneficial impacts to significantly affect any fish populations (see discussion above).

<u>Effluents and Discharges</u>. One hundred and seventy-six exploration, delineation, and development wells are expected to be drilled in this basin over a 9 year period. Effluents and discharges from these wells could cause sublethal or lethal impacts to a few individual fish concentrated near each drilling site (see discussion above). However, it is unlikely that enough wells would be drilled near any one fish species to cause a significant decline. Therefore, no significant decrease in fish populations due to effluents and discharges is expected.

Noise. Noise from geophysical vessel operations is not expected to significantly harm any fish resources since a limited number of geophysical vessels probably will be used in this area at one time.

AREAS OUTSIDE THE PROPOSED SALE AREA

Fish resources outside the proposed sale area may be vulnerable to impacts from oil spills that originate in the proposed sale area or along tanker routes.

Central California. North of the proposed sale area, no significant decrease in fish populations are expected. Northern anchovies, Pacific herring, salmon and squid are the most vulnerable species to oil spills in Central California since they are the principal species that concentrate in the surface layer of shallow nearshore areas.

Northen Anchovies. Little, if any, reduction in this species north of the proposed sale area is expected since the probability that a large oil spill will occur and contact a large school of anchovies is very low even after 30 days (e.g., 1 percent Monterey Bay). Although unlikely, if a large oil spill does contact a large school of anchovies, a small 1-2 year reduction in the contacted population could occur (see discussion above). Reduction in the Monterey Bay population would be of particular concern since, based on commercial fishing data, a large number of anchovies live in the Bay.

Pacific Herring. Little, if any, reduction in this species north of the proposed sale area is expected since the probability that a large oil spill will occur and contact an important spawning area is very low even after 30 days (e.g., 0 percent San Francisco Bay). Although unlikely, if a large oil spill does contact a Pacific herring spawing ground, a moderate reduction in the contacted population lasting 3-5 years could occur (see discussion above). Reduction in the San Francisco Bay population would be of particular concern since this is a major spawning area.

Salmon. Salmon apparently use chemical cues to return to their native streams to spawn. Since oil can interfere with their ability to detect these natural cues, these fish are particularly vulnerable to oil when they first enter the sea as young and later when they return to spawn. Field tests have shown (Malins, 1980) that salmon will initially avoid an oil contaminated fish ladder but later some will use the ladder despite the presence of oil. Also, salmon have been shown to avoid oil in laboratory experiments (Rice, 1973). Therefore, a large oil spill (or many small oil spills) near the mouths of rivers probably would prevent some salmon from returning to their native streams to spawn and delay the spawning runs of other salmon. This could lead to a reduction in the salmon populations. Although many anadromous fishes occur in California, king salmon and silver salmon are of concern since: 1) these species die after spawning and successful spawning is very important to survival of these populations; and 2) these species are already stressed from fishing pressure and continuing habitat degradation. Interference with the spawning runs of these species (juvenile and adult stages) during one spawning season, coupled with potential impacts to their food supply, could cause a moderate reduction in these populations. Since salmon die after spawning and they are stressed from fishing pressure and continuing habitat degradation, recovery is expected to be slow, taking 5 years or more.

However, little, if any reduction in these populations is expected as a result of the proposal since the probability that a large oil spill will occur and contact the areas near the mouths of rivers where salmon concentrate is very low even after 30 days (e.g., 0 percent Sacramento River area, 1% San Lorenzo River). Although unlikely, if a large oil spill does contact a salmon spawning stream, a moderate reduction in the contacted population could occur. Recovery is expected to take 5 years or more. Reduction in the Sacramento River population would be of particular concern since this river is a very important spawning area for king salmon.

Squid. During most of their lives, squid (all life stages) are widely distributed and probably would not be impacted very much by oil spills. However, when squid reach maturity in 1-2 years, they move inshore to spawn in large numbers. Since squid die after spawning, successful spawning is important to their survival. A large oil spill (or many small oil spills) contacting a large concentration of squid could affect their food supply or kill enough individuals or eggs to cause a small reduction in the population. Since squid are abundant and reach sexual maturity rapidly, recovery is expected to be rapid taking 1-2 years.

However, little, if any, reduction in this species is expected since the probability that a large oil spill will occur and contact a large concentration of squid is very low even after 30 days (e.g. 1 percent Monterey Bay). Although unlikely, if a large oil spill does contact a large concentration of squid, a small 1-2 year reduction in the contacted population could occur. Reduction in the Monterey Bay population would be of particular concern since a large number of squid spawn in the Bay.

Southern California. South of the proposed sale area, no significant decreases in fish populations are expected.

Little, if any, impact from oil spills is expected since the probability of a large oil spill occurring and contacting this area is low even after 30 days (e.g., 14 percent northern half of San Miguel Island, 4 percent northern half of Santa Rosa Island, and 0-2 percent for all other areas). However, although unlikely, if a large oil spill occurred and contacted a large school of northern anchovies or squid, a small 1-2 year reduction in the northern anchovy or squid populations contacted could occur (see discussion above). Reduction in Southern California populations would be of particular concern since a large number of anchovies and squid occur in this area.

As a result of all proposed activities discussed above, little, if any, reduction in any fish population is expected. This is not a significant impact. Therefore, the regional impacts to fish resources are expected to be very low (sublethal and lethal changes insignificant).

ii. Conclusions: The proposal is expected to result in very low impacts to fish resources (sublethal and lethal changes insignificant). However, although unlikely, the proposal could result in: 1) a small 1-2 year reduction in a northern anchovy population; 2) a moderate 3-5 year reduction in a Pacific herring population; 3) a moderate reduction in a salmon population lasting 5 years or more; and 4) a small 1-2 year reduction in a squid population. Therefore, although unlikely, the overall regional impacts to fish resources could be moderate (moderate or high reduction in the population sizes of a few species).

iii. Cumulative Impacts: Without the proposal, fish populations are expected to decrease due to fishing pressure, sewage disposal, natural oil seeps, existing and proposed offshore oil and gas leases (State and Federal), tanker transportation of foreign and Alaskan crude oil imports, and other vessel traffic (see Sections I.C. III.C.5, III.C.6, III.C.12, IV.A.4., IV.C.3, and IV.D for descriptions of these actions).

Fishing pressure is probably the most important stress on fish resources. Large to very large amounts of fish are taken by commercial and sports fishermen (see Sections III.C.5 and III.C.6). However, to ensure that fish resources are not depleted, the Pacific Fishery Management Council, in cooperation with the U.S. Department of Commerce and State Fish and Game agencies, regulates the amount of harvest, harvest seasons and type of gear to be used by foreign and domestic fishermen.

Oil spills from existing and proposed leases, tanker transportation of foreign and Alaskan crude oil imports, and other vessel traffic potentially could also be an important stress, particularly when added to oil from sewage disposal and natural oil seeps. Over the life of the proposal, 3 large and many small oil spills are expected to result from existing Federal leases (in the Santa Maria Basin and Southern California). Also 4 large and many small oil spills are expected to result from tanker transportation of foreign and Alaskan crude oil imports. Based on the Oil Spill Risk Analysis Model, the areas expected to be contacted (by large oil spills) are near San Francisco Bay (Tomales Bay to Princeton) and the Santa Barbara Channel (mainland coast and northern halves of San Miguel, Santa Rosa, and Santa Cruz Islands) (see Section IV.A.4.a.). Other areas (particularly in Southern California) also may be contacted by oil since: 1) one large oil spill is expected from the Proposed Southern California Lease Offering, February, 1984 (Minerals Management Service, 1983), 2) additional oil spills (number unknown) are expected to result from existing and proposed oil and gas development in State tidelands, and vessel traffic other than tanker transportation of crude oil imports, and 3) additional oil (amount unknown) is expected to be released as a result of sewage disposal and natural oil seeps. The cumulative effect of oil from all of these sources is expected to result in: 1) a moderate reduction in salmon populations lasting 5 years or more; 2) a moderate reduction in Pacific herring populations lasting 3-5 years; and 3) a small 1-2 year reduction in northern anchovy and squid populations (see discussions above).

Many manmade structures exist or are expected to be placed in California waters as a result of existing or proposed offshore oil and gas leases (State and Federal). These structures include more than 59 platforms, 7 artificial islands, 59 subsea completions, 219 miles of pipeline and 21 marine terminals (see Sections IV.C.3 and IV.D.4 for details). No significant decrease in fish populations due to these structures is expected since it is unlikely that enough structures will be placed in any important feeding or reproductive areas to significantly affect any fish populations (see discussions above).

At the same time, these structures are expected to cause a small increase in fish populations by: 1) acting as artificial reefs (e.g., increasing rockfish populations), 2) being used for mariculture operations (e.g., for growth of mussels), and 3) causing adverse impacts to commercial and sportfishing operations (e.g., commercial trawl fishing for bottom fish).

Also as a result of existing and proposed oil and gas activities, a large volume of effluents and discharges have or are expected to be released into the ocean from more than 526 exploration and delineation wells and more than 1862 development wells (see Sections IV.C.3 and IV.D.4 for details). These effluents and discharges could cause sublethal or lethal impacts to a few individual fish concentrated near each drilling site (see discussion above). However, it is unlikely that enough wells would be drilled near any one fish species to cause a significant decline. Therefore, no significant decrease in fish populations due to effluents and discharges is expected.

Geophysical vessel operations have been conducted in California for many years, and additional operations probably will occur as a result of existing Federal and State leases. Noise from these operations is not expected to significantly harm or frighten fish since a limited number of geophysical vessels probably will be used in this basin at one time.

The cumulative effect of all of these stresses particularly fishing pressure, is expected to cause large to very large decreases in fish populations. The proposal is expected to add a very small (insignificant) amount to other causes of decreases in fish populations, but the overall cumulative impacts are expected to be the same - large to very large decreases in fish populations.

d. Impact on Marine Mammals

i. Discussion: This section presents an overview of potential impacting agents on marine mammals including seals, sea lions, dolphins, porpoises, whales and the southern sea otter. Much of the information discussed below is excerpted from a review paper by Cowles (1981). Supplemental references and information were suggested in a 1981 draft background paper by Dr. F.R. Englehardt for the National Academy of Sciences.

Three classes of impact agents are considered:

(1) Oil;
(2) Human activity and noise; and
(3) Other potentially toxic impact agents such as drill muds.

The acute or short-term impacts of these agents on pinnipeds, cetaceans, and sea otters are reasonably well understood. Chronic or long-term impacts of oil, noise or stress are poorly known, due largely to the difficulty in studying these animals in their natural environment and the difficulty of conducting any type of controlled experiment in the open ocean. Therefore, the impacts discussed below are, based on limited data and, in some cases, extrapolation from terrestrial mammals including man.

Oil Spills. Oil from oil spills can impact marine mammals in several ways: 1) direct contact, 2) toxic effects from ingestion, both acute and long-term, 3) habitat disruption, and 4) disruption of food sources.

Direct Contact Effects. Sea otters are susceptible to thermal stress if oiled. This species minimizes heat loss with its fur rather than with a layer of blubber. Costa and Kooyman (1978) felt that exposure of sea otters to crude oil in natural environments "would probably cause significant thermal stress and could lead to hypothermia and/or pneumonia resulting in death." Exposure to dispersants would likely have the same effect. Fur Seals, (northern and Guadalupe) would also experience hypothermia and death if oiled. Haired seal pups such as harbor seals may also be susceptible to thermal stress while dependent on their prenatal fur (lanugo) for maintenance of body temperature. Mortality of oiled seal pups may also occur due to drowning. Davis and Anderson (1976) reported the death of gray seal pups when their prenatal fur became oiled and they were apparently unable to swim. On the other hand, LeBoeuf (1971) reported no adverse effects to elephant seal pups after the 1969 Santa Barbara spill. In many observations of oiled pinnipeds, it has been difficult to correlate cause and effect.

Laboratory studies by St. Aubin and Geraci (1982), found petroleum hydrocarbons produced only "mild and transient damage" to dolphin epidermis. To date, there have been no observations of oil-covered whales. Baleen whales may also contact oil while feeding. The Pacific right whale would probably be the most susceptible to baleen fouling since it is a true surface skimmer and might also skim oil. The gray whale might engulf oil in bottom sediments or kelp. Laboratory studies to date however, indicated baleen plates only remain fouled for a few hours to days when a stream of water played on them. Should the baleen plates not clear in a short period of time under natural conditions, is possible that death could result. Blow holes could also foul with oil although cetaceans spout before inhaling and thus clear their blow hole; it is possible juveniles might inhale oil. Observations of gray whales off Coal Oil Point however, indicate gray whales utilize these oiling areas with no apparent adverse effects. There is evidence that some of the marine mammals can detect oil and learn to avoid contact if possible. However, all of these animals must come to the surface to breathe, and some feed on the surface. In a very large spill, at least some of the animals would be oiled and some mortality would likely result.

Sea otters and the impacts of oil are discussed in Section IV.D.2.f.

Fur Seals and Oil. The only major breeding populations of northern fur seals outside of Alaska are concentrated on San Miguel Island. Should a spill contact areas around the island during the breeding season there could be high regional impacts, that is, a large percent of the entire California population might perish from cold related impacts such as hypothermia and pneumonia. Fur seals from the Pribilof, Commander, and Kuril Islands , Alaska also winter off California and are susceptible to spills at sea. CCMS (1982) recorded a peak abundance of 1.2 animals per 1,000 km surveyed.

Guadalupe fur seals are also highly susceptible to oiling but the number present in Southern California is so small as to not be considered a population. However, should these seals recolonize San Nicolas or San Miguel Islands and a spill occurred in the vicinity, impacts could be high to very high for the region, that is, jeopardy for the California population and recolonization could be delayed.

Harbor Seals and Oil. Very young pups are susceptible to cold stress if oiled. However, harbor seal colonies are fairly evenly distributed along the coast. No colony appears to contain more than 5 percent of the population although concentrations occur between Point San Luis and Diablo Cove and Point Conception and Government Point. Additionally young pups are only present during a few months. Adults are not particularly vulnerable to oiling. Both possible and probable impacts are therefore low. Impacts (mortality) from an oil spill should be limited to a small percent of the years pup production.

Other Pinnipeds. The remainder of the California pinnipeds (California sea lion, Stellar sea lions and elephant seals) are not thought to be particularly sensitive to oiling. Potential impacts from an oil spill are probably low, that is mortality should be minimal.

Small Cetaceans and Oil. Endangered whales are further discussed in Section IV.D.2.f. In most cases, skin and eye irritations and blow hole fouling are expected to clear within a short period of time (see discussion above). Potential impacts from direct contact with an oil spill are estimated to be low.

Toxic Effects of Oil. Oil can enter the body by ingestion, inhalation, or through the skin (Englehardt 1977). The ability to detoxify or store hydrocarbons will depend on the fractions involved, the species of animal and the way oil enters the body.

Studies on the toxic effects of oil on marine mammals are sparse. Changes in hormone balances were found by Kashin, et al (1963). In experiments conducted by St. Aubin and Geraci (1962), vomiting, reduced feeding, liver damage and high parasite levels were recorded. The authors did not attribute the effects to oil. However, experimental controls were insufficient to eliminate oil as a causitive factor. St. Aubin and Geraci also detected no lung pathology in ringed seals exposed to the volatile fractions of petroleum. But, because marine mammals are at the top of the food chain, accumulation of toxic materials is possible. Petroleum or other toxic materials may be stored in the fat and later released during migration or breeding, when food consumption is low. St. Aubin and Geraci found detectable levels of napthalene (a persistent petroleum residue) is most tissues analysed from marine mammals stranded along the Atlantic coast, indicating some petroleum factions are being stored. The presence of mixed function oxidases, however, suggests cetaceans and possibly other marine mammals can detoxify petroleum (Malins, 1977). It is also possible, however, that the oxidases may convert petroleum to more toxic compounds which are then stored (Malins, 1981).

Exposure will most likely contribute to the stress of any marine mammals. Among other effects, stress can lead to higher mortality and decreased reproduction. For a further discussion, see Bureau of Land Management (1980) and Cowles (1981).

Since activities from the Proposal are expected to contribute very little to OCS hydrocarbon levels (see Section IV.E.1.a), the impacts due to the toxic effects of oil are estimated to be low, that is reduce the health of the populations slightly. The effects may extend for the life of the Proposal.

Habitat Effects of Oil. The colonial breeding behavior of seals and sea lions makes them vulnerable to oiling of their habitat. Geraci and St. Aubin (1980) felt that changes in feeding, diving, mother-pup interaction, herd organization, and haul out behavior may affect survival. Mike Bonnell at U.C. Santa Cruz is concerned that repeated disruption by small spills and human activities may cause desertion of prime pupping areas, which would lead to use of less desirable sites and reduced survival of young (personal communication, 1982). Such an effect was recorded on San Nicolas, where increased military personnel activities caused the pinnipeds to clump on one area of island. Severe crowding resulted.

The impact levels of rookery disruption are discussed below under Human Activity and Noise.

Effects of Oil on Food. Lowry, et al., (1978 and 1979) reviewed mechanisms by which prey species such as anchovies may be effected by oil toxicity. See also section IV.E.2.C. BLM (1980), Sale No. 53 contains the following comments on food:

> "Due to the patchiness of pelagic fish and plankton, food die-offs would be very local and recovery should be rapid."

Reproduction in colonially breeding pinnipeds is apparently limited by the availability of food. Even small changes in prey abundance may cause alterations in reproduction. However, it is doubtful impacts would exceed the low level, that is loss of a few percent of the year's young or adults.

Recovery should occur in 1 or 2 years. (See Section IV.E.2.e for impacts on fish.)

Human Activity and Noise. Cowles (1981) includes a comprehensive discussion of the variability of effects of noise on marine mammals. Cowles stated, "The responses of animals to acoustic stimuli have generally shown variance in behavioral and physiological effects dependent on species studied, characteristics of the stimuli ... transmission medium, season, ambient noise, previous exposure of the animal, physiological or reproductive state of the animal, etc."

Noise impacts may come from seismic activity, drilling, pipelaying, platform activities, tankers, and crew boats, fixed-wing aircraft and helicopters.

Many marine mammals are apparently highly dependent on acoustics for communication, food location, special orientation and avoidance of predators. The toothed whales (porpoises, dolphins, killer whales, and sperm whales) have a highly developed ecolocation capability and may also stun prey with sound (Norris, 1978). Use of sound by the endangered baleen whales is less certain and hearing capabilities probably vary within the group (Cowles 1981).

In the laboratory, high frequency sound has caused permanent ear damage to marine mammals. It is also quite possible increased noise levels may cause stress to the animals much as industrial noise increases stress levels in humans. Dohl, et al., (1978) spectulates that "the reasons for the apparent increase in utilization of offshore waters are unknown, but might be the result of increased human activity in the Bight, increased gray whale numbers or some combination of both factors." However, some marine mammals are attracted to boat noise, while others show definite aversion. Gray whales apparently acclimate to some level of human activity in their environment as demonstrated by their use of busy offshore areas near Los Angeles and Newport. This appears to vary with seasons and particular animals.

Gales (1982) in a study of platform noise concluded that although low frequency components may be instrumentally detected on the order of hundreds of miles, a more likely range for the detection by whales was on the order of a few hundred yards. Gales estimated 150 yards for the Santa Barbara area and 3500 yards of Lower Cook Tolit, Alaska. Although these sounds were well above the level of detectability, they were substantially less than those produced by supply and work boats. Platforms noise was apparently the same during production and drilling. However, some platforms were much quieter than others, suggesting platforms can be designed to reduce noise.

Seismic activity in the area has probably the potential to cause damage to the hearing apparatus of cetaceans or to cause changes in migration routes or habitat utilization. For ear damage to occur the animals would need to be in close proximity to the seismic sound source.

In spite of seismic activity in northern and southern California, gray whale populations have continued to increase. However, preliminary observations by Bolt, Bernack and Newman, in a study being performed for MMS, indicate there may be changes in the whales' direction of movement during some close seismic activity. In the event study results indicate serious problems, the Federal

Code of Regulations, CFR 250.12, enables MMS to eliminate seismic activities during sensitive periods.

Aircraft, crewboats, and crews are a serious concern for pinnipeds. Stellar sea lions and harbor seals spook easily from rookeries. California sea lions will flush just from a shadow and even elephant seals will abandon the rookery if sufficiently disturbed. Elephant seal pups would probably suffer mortality if the mothers are forced from the rookery. However, the major concern is abandonment of the rookery for a less favorable site.

Should a spill occur nearby or human activities disrupt the rookeries, disruption of the rookery could cause loss of as many as half of the year's pups or impair breeding behavior. Due to the loss of a significant portion of the year's pup production, recovery could take several years. However, with good contingency plans, these impacts should be avoidable. Of greater concern is the possible repeated disruption due to aircraft, helicopters, and additional personnel in the area. Sufficient disruptions to cause rookery abandonment are considered unlikely but low impacts due to some disruption is expected. Recovery from a single disruption should occur the following year. Areas of concern for pinnipeds and the potential impact levels are listed below. The potential levels of impact due to noise and disruption are based on the percentage of the California population present: 5-15 percent - very low to low, 15-30 percent - low to moderate, 30 to 60 percent - moderate to high, over 60 percent - high to very high. The higher level would occur only if repeated disruptions caused rookery abandonment.

(1) Farallon Islands (Santa Cruz Basin)
Harbor seals - vlo to lo (480 seals)
Elephant seals - vlo to lo (580 seals)

(2) Ana Nuevo (Santa Cruz Basin) - overall high potential
Stellar sea lions - lo to mo (290 sea lions)
Harbor seals - vlo to lo (71 seals)
Elephant seals - mo to hi (4,600 seals)

(3) Pt. Buchon to Pt. San Luis
Harbor seals - vlo to lo (850 seals)

(4) Northern Channel Islands (Southern California) - overall high potential
San Miguel Island west end
Northern fur seals (2 colonies) - mo to hi (4,000 seals)
Elephant seals - lo to mo (24,200 seals)
California sea lion - lo to mo (24,400 sea lions)

(5) Leeward side of Channel Islands
Harbor seals - lo to mo (1,200 seals)

(6) Pt. Conception to Government Pt.
Harbor seals - vlo to lo (600 seals)

Potentially Toxic Chemicals. Drilling muds have been considered a possible source of rare metals which could be toxic in sufficient quantities. Formation effluents may also contain rare metals. Current information, however, indicates rare metals from those sources are not biologically available. In addition, bottom sediments temporarily resuspended during drilling may contain deposits of other contaminants such as hydrocarbons and DDT previously discharged into ocean waters. Available data on the bioaccumulation of toxic materials in marine mammals and other marine vertebrates is inconclusive. At this time, impacts from drill effluents are expected to be insignificant due to dilution factors and the near background concentrations of many of these elements in drill muds and formation waters (see Section IV.E.a.1).

According to the Oil Spill Risk Assessment Model and the resource estimates discussed in Chapter II, one oil spill is expected to occur and contact land within 30 days as a result of the proposal. It is expected that if a spill occurs it will be in the Santa Maria Basin. Contact will most likely occur in the area of San Miquel which is outside the Proposed Sale Area.

Potential and estimated impacts from the Proposal are summarized in Table IV.E.2.d-1.

PROPOSED SALE AREA

One spill is expected to occur in the Proposed Sale Area as a result of the proposal. However, no contact is expected with the coast in the Santa Maria Basin. Therefore, contact is not expected with the significant pinniped colonies. However, a small reduction in pelagic fur seals and other species may occur due to the one spill, recovery requiring 1 to 3 years. Harbor seals may experience low impacts due to aircraft noise.

Five platforms are expected in the Sale Area. If cetaceans are more sensitive to platform or seismic noise than is expected, some changes in habitat usage could occur. The likely impact would still be very low but could continue for the life of the Proposal.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. No oil spills or drilling operations are expected in the Bodega, Santa Cruz or northern Santa Maria Basins and disruption of rookeries should be avoidable. Therefore, expected impacts to all species are very low.

There are no significant pinniped impacts within the Bodega or northern Santa Cruz Basins. However, in Santa Cruz Basin should an unexpected tanker spill occur and contact rookeries or feeding areas associated with the Farallon Islands or Ano Nuevo, significant impacts would likely occur due to direct contact, toxicity and possible noise and disruption.

Southern California. One oil spill is expected to occur in the Santa Maria Basin and to contact the 6-mile buffer zone around the Northern Channel Islands. No spills are expected to contact the remainder of the coast. The most likely area for contact in the Channel Islands is the northern side of San Miguel. Should the spill occur during pupping season (May to August) impacts to the northern fur seal could be high (high mortality to the California population requiring 1-2 decades for recovery).

ii. Conclusions: Impacts to the northern fur seal are expected to be high (high mortality to the California population requiring 1-2 decades for recovery) if the one spill expected to contact the northern Channel Islands occurs during pupping or breeding season. Impacts to all other species - seals, sea lions, porpoises, and dolphins are expected to be low.

iii. Cumulative: Sewage disposal, increased recreational traffic, commercial fisheries, expanding population centers along the coast, habitat loss, changes in climatic conditions or other nonhydrocarbon related activities may result in changes in species abundance and distributions. However, most pinniped numbers are increasing annually and will probably be limited by habitat availability rather than impacts from nonhydrocarbon related impact agents. The impacts on the small cetaceans is uncertain. Whales and the sea otter are discussed under threatened and endangered species.

As a result of Alaskan and foreign tankering, existing state and federal leases, and the "most likely" scenario of the Proposal, 8 spills greater than 1,000 bbls are estimated.

The oil spill model estimates 8 oil spills will contact land within 30 days: one of these contacts is estimated to result from the Proposal. The area of concern for marine mammals that is likely to be contacted by an oil spill within 30 days from the cumulative source is the northern Channel Islands which is estimated to be contacted by 3 spills.

The likely impacts from these contacts are, high impacts to the northern fur seal due to high mortality requiring 1 to 2 decades for recovery. There is a high likelihood that northern fur seals may experience these high impacts more than once during the life of the Proposal resulting in very high impacts requiring decades for recovery. Harbor seals are likely to experience low impacts from oil.

Since spills are also likely to contact feeding areas offshore, it is likely that other pinnipeds and cetaceans will contact oil. Since 8 spills are estimated it is likely contacts will occur more than once. Although the impacts to these mammals from a single oil spill are probably low, several spills are likely to cause moderate impacts due to mortality requiring several years for population recovery.

The one spill estimated to occur due to the Proposal is most likely to cause high impacts due to the death of fur seals. Therefore, the Proposal is likely to contribute a large amount to the very high impact on fur seals due to oil spills.

Sixty-four platforms are projected: 32 for the Santa Barbara Channel, 21 for Central California and 11 more in Southern California as a result of existing state and federal leases and the "most likely" scenario of the Proposal. Five of the total are expected to be as a result of the Proposal.

This degree of activity with attendant noise and disruption from boats, aircraft and seismic activity is likely to cause disruption to pinniped populations on the northern Channel Islands resulting in moderate reduction in reproduction. These impacts may last for the life of the Proposal. It is possible harbor seals and sensitive species of the small cetaceans may also experience some decrease in population numbers. The 5 platforms that are expected to result from the Proposal will probably contribute a small amount to the impacts from noise and disruption. The tracts and therefore platforms are at least 3 miles offshore and not in sufficient number to greatly increase air and boat traffic.

In conclusion, cumulative impacts to marine mammals are likely to be very high due to repeated high mortality to northern fur seals requiring decades for recovery. Impacts due to reproductive losses or mortality of other species will be low to moderate and require several years for recovery. Impacts caused by the "most likely" scenario of the Proposal will probably add a large amount to the cumulative impacts due to the estimated impacts to the northern fur seal from an oil spill. Noise and disturbance from Proposal platforms, boats, aircraft, etc., will contribute a small amount to the impacts from these sources.

e. Impact on Seabirds

i. Discussion: Much of the following information on impact agents and levels is taken from review articles by R.B. Clark (in Press) and Holmes and Cronshaw (1977). Brown pelicans and other endangered and threatened species are discussed in Section IV.E.2.f.

Potential impact agents from the Proposal include:

(1) Oil spills and cleanup activities

(2) Increased human activity and disruption

(3) Potentially toxic substances

Oil Spills. Oil from oil spills can impact seabirds in several ways: 1) direct contact with floating oil, 2) toxic effects of oil, both short and long term, 3) habitat destruction, 4) food losses, 5) cleanup activities.

Contact effects of oil. Most of the immediate mortality or disabling of pelagic seabirds is due to floating oil contacting the plumage. Oil disrupts the fine feather structure; water-repellent, insulating and bouyant properties of the contour feathers are impaired.

Mortality will depend on the species involved. Evidence indicated that seabirds avoid or try to avoid making contact with crude oil. However, species such as the alcids, that forage underwater and spend the better part of their lives on the ocean surface are more likely to encounter oil. Moreover, these birds will often dive when threatened. This means of escape, in the presence of oil, is apparently not effective, for the bird is, while underwater, unaware of the location of the oil. Seabirds such as gulls that roost on land or spend more time on the wing are less likely to encounter floating oil, and are presumably more adept at avoiding oil by simply flying away (Nero, 1982).

The colonial nature (i.e., the tendency to nest, feed and rest in large groups) of some species of seabirds will also make the populations more likely to suffer high impacts. For example, Weins et al. (1978) calculated that due to their colonial nature, 30 to 50 percent of the St. George breeding population of murres could be eliminated by a 1,000 bbl spill.

The number of birds historically lost due to spills is variable. Mortality is influenced by weather, season, local feeding behavior, time of day, and type of oil as well as the species present. Based on beached bird data, Holmes and Cronshaw (1977) compared spill sizes with the number of recovered dead birds. Numbers ranged from about 50 to almost 13,000 birds recovered per 1,000 bbl of crude oil spilled. The fraction of total dead birds represented by the beached birds will depend on currents, winds, distance from shore, etc. In most instances beached birds are thought to represent well below 50 percent of the total mortality. Based on historical data, a large spill (1,000 to 10,000 bbl) might result in a few deaths or tens of thousands.

Woodward and Clyde (1982) compiled an Index of Sensitivity to oil spills for central-northern California. Table IV.E.2.e-1 lists the relative level of concern for nesting species. For purposes of this analysis it is assumed

TABLE IV.E.2.e-1

CALIFORNIA BREEDING DISTRIBUTION, WORLD BREEDING DISTRIBUTION, AND VULNERABILITY TO OIL IN NEAR COASTAL WATERS OF SEABIRDS SPECIES FOUND IN CENTRAL AND NORTHERN CALIFORNIA.

Species	Breeding Distribution California[2]	Breeding Distribution World	Vulnerability to Oil[3,4] (due to behavior)	Overall Level of Concern[5,6]
Fork-tailed storm-petrel	Concentrated (Castle Rock)	Circum N. Pacific	Low	3°
Leach's storm-petrel	Concentrated (Castle Rock)	Circum N. Pacific & N. Atlantic	Low	3° (tertiary)
Ashy storm-petrel	Concentrated (Farallon Isl.)	California	Low	2°
Brandt's cormorant	Concentrated (Farallon Isl.)	West Coast N. America	Moderate	2° (secondary)
Double-crested cormorant	Regional (Primarily N. California)	N. America	Moderate	2°
Pelagic cormorant	Widespread	Circum N. Pacific	Low	3°
Western gull	Concentrated (Farallon Isl.)	West Coast U.S. & Mexico	Low	3°
Common murre	Concentrated (Castle Rock)	Pacific & Atlantic N. latitudes	High	1° (primary)
Pigeon guillemot	Widespread	Circum N. Pacific	High	3°
Cassin's auklet	Concentrated (Farallon Isl.)	N. America	High	1°
Rhinoceros auklet	Concentrated (Farallon Isl.)	West Coast N. America	High	1°
Tufted puffin	Concentrated (Castle Rock & Farallon Isl.)	Circum. N. Pacific	High	1°

Legend:

1 Table 1 is adapted from Woodward-Clyde (1982).

2 From Sowls et al. 1980.

3 From Sowls et al. 1980, King and Sanger, Ohlendorn et al. 1978.

4 Vulnerability is a function of the birds behavior (feeding, nesting, flocking, resting). The levels of vulnerability represent the possibility that a substantial number of birds will come into contact with oil within the study area, thereby potentially affecting the breeding population in California. Levels assigned are independent of sensitivity to oil.

5 Overall concern for the species depends on a combination on the California and world breeding distribution and the vulnerability to oil.

6 In the case where the California population is concentrated, only concentrated areas such as the Farallon Islands for Cassin's auklets will have the maximum sensitivity shown in the table.

that 50 percent of a colony of primary (1^o) concern can die in a large oil spill (greater than 1,000 bbl) and 25 percent of a colony of secondary (2^o) concern and 12 percent of a species of teritary concern.

Seabird colonies occur along the coast within the proposed sale area, Morro Rock, Diablo Rock, Diablo Canyon, Pecho Rock, Fossil Canyon, Shell Beach Rocks. However, none of these colonies exceed 200-300 birds nor have more than 1 percent of a sensitive species.

Some migrants, such as surf scoters, are commonly recovered after an oil spill. Other migrants such as sooty shearwaters become highly vulnerable to an oil spill when they congregate in dense flocks of over 1/2 million birds within an area the size of Monterey Bay.

Many of the migrants commonly use near coastal waters with depths up to 100 meters as well as estuarine habitats such as Morro Bay. Because the 100 m water depth lies fairly near the coast within the sale area, and the resolution of the oil spill model is about 2 miles, coastal waters used by migrants are considered equivalent to land for purposes of determining oil spill contact. Concentrations of birds are sometimes seen in or near bays such as Morro Bay, Port San Luis and Pismo Beach.

Large numbers of migrants also utilize estuarine habitats such as Morro Bay. However, it should be possible to protect Morro Bay from an oil spill by booming: see Section IV.B.2. Morro Bayresources are further discussed in Alternative II.

Historically, however, mass kills of migratory birds have been a a result of an unusual combination of weather and physical factors (see Holmes and Cronshaw (1977) for examples). Therefore, although possible, significant impacts to migratory species are not expected. Shorebirds and waders are also not discussed in detail because they have not shown up in significant numbers in beached bird data and therefore are assumed not to be seriously impacted by oil spills.

Table IV.E.2.e-2 adapted from Woodward and Clyde (1983) tabulates central-northern Calfornia seabird nesting colonies containing more than one percent of the California population for species determined to be of primary (1°) or secondary (2°) concern. (See Tables IV.E.2.e-1 and 2 for a discussion of criteria.) Tertiary (3°) concern species are not tablulated. It is assumed that impacts to these species will not exceed the very low (insignificant) level.

Calculations by Weins et al. (1978) and (1980) indicated recovery times may take 50 to 100 years. However, Clark (in Press) felt that recovery from spills was more rapid and The Royal Commission, Section 3.52 (1981) felt auk (alcid) colonies were actually increasing in spite of oil pollution in the North Atlantic. For purposes of this analysis it is assumed large populations will take several decades to recover after a large or very large spill.

Potential impacts to the California population of seabirds are listed in Table IV.E.2.e-2. These levels are based on the highest impact level likely at each colony. (See Appendix A for a definition of impact levels.)

TABLE IV.E.2.e-2

SENSITIVE SEABIRD NESTING COLONIES AND BIRD SPECIES OF EITHER PRIMARY OR SECONDARY CONCERN NESTING AT EACH LOCATION 1,2

	Potential Regional Impact Level Due to Oils 3,4	Ashy Storm-Petrel 2° Feb-Nov 5,187	Brandt's Cormorant 2° Mar-Aug 64,210	Double-Crested Cormorant 2° Apr-Aug 1,884	Common Murre 1° May-July 363,154	Cassin's Auklet 1° Mar-Sept 131,170	Rhinoceros Auklet 1° Uncertain 362	Tufted Puffin 1° May-Aug 250	Brown Pelican 2° Feb-Oct 2,690
BODEGA BASIIN									
Fish Rocks							X	X	
Russian River Rocks				X					
Bodega Rock			X						
Gull Rock			X						
Point Reyes			X		X			X	
Double Point Rocks					X				
Point Resistance					X				
SANTA CRUZ BASIN									
Farallon Islands	hi-vhi	77%(hi)	44%(mo)	10%(lo)	17%(mo)	80%(vlo)	28%(mo)	40%(hi)	
Bird Rock			X						
SANTA MARIA BASIN									
Bird Island			7%(vlo)						
Partington Ridge North			X						
Cape San Martin			X						
Piedras Blancas			X						
Point Arguello	lo						8%(lo)		
NORTHERN CHANNEL ISLANDS									
Anacapa West	hi			7%(vlo)					94%(hi)
Santa Rosa Island			X						
Castle Rock (San Miguel)		X	X			X			
Prince Island (San Miguel)	mo	12%(lo)	X			15%(mo)			

1. Adapted from Woodward Clyde (1982)

2. Colonies listed contain at least 1 percent of the California nesting population of species of primary or secondary concern. X indicates species between 1 and 5 percent of the California population at that site. Percentages are percent of California nesting population of the species.

3. Site locations and numbers of birds were obtained by Woodward-Clyde from Sowls et al. (1980).

4. Based on the assumption that 50% of a population of 1° concern and 25% of a population of 2° concern would likely be killed in a large oil spill. The relationship between colony size and impact level to the California population of a species is as follows:

   Very Low (vlo) = less than 5% of 1° species or 10% of 2° species
   Low (lo) = 5-15% of 1° species or 10-30% of 2° species.
   Moderate (mo) = 15-30% of 1° species or 30-60% of 2° species.
   High (hi) = 30-60% of 1° species or greater than 60% of 2° species.
   Very High (vhi) = Greater than 60% of species of 1° concern or cumulative effects of several species.
   See discussion for more details.

Thirty-five percent, approximately 236,000, of California's seabirds nest on the Farallon Islands. If a very large (greater than 10,000 bbl) spill should occur in this area during nesting season, the regional impacts could be very high (over 30% reduction in some species; recovery taking decades) due to high mortality.

Although a large percentage of feeding and flocking occurs near the coast or the islands, birds feeding at sea are also potentially impacted by an oil spill. However, concentrations are usually less, the likely impact would be low (mortality requiring 1-3 years for population recovery).

Toxic effects of oil. Most ingestion of oil occurs during preening (Nero, 1982). Acute toxicity may result from oil. Recovered birds have shown wasting of fat and muscle tissue, abnormal conditions of major organs such as the liver, kidneys and adrenals and inhibition of pituitary function (Holmes and Cronshaw, 1977). Recovered birds also show symptoms of severe dehydration (Berkner, personal communication) apparently caused by malfunction of the salt gland which regulates the water/salt balance. Several salt excretion studies indicate weathered crude may be the most toxic in respect to maintenance of water/salt balance (Clark, in Press).

Increased mortality may occur in bird eggs contaminated with fresh crude from the adults. This has been demonstrated for mallard ducks, Cassin's auklets and gulls (Clark, in Press). Brown pelican eggs were found contaminated on the east coast (Oil Spill Intelligence Report, 1982) but no study was made of the mortality.

Longer term or sub-lethal effects of oil include delayed and depressed egg laying, reduced hatching and reduced growth rate due to poor nutrient uptake. Experiments on sub-lethal effects have been limited. Some of the observed effects are undoubtedly due to laboratory conditions and applicability of these experiments to the marine environment has yet to be determined (Clark, in Press).

Birds that do not die from ingested oil will suffer reduced health and "few animals in poor condition survive very long in the natural environment" (Royal Commission on Environmental Pollution 1981). The level of mortality due to the toxicity of oil cleaned from feathers or ingested with food is uncertain. However, these impacts will add to the direct contact effects and delay recovery time.

Habitat Loss Due to Oil Spills. Most pelagic seabirds nest on islands, stacks or in protected rocky cliffs. Sandy beaches are important to the least tern and snowy plover. These areas are not particularly vulnerable to nest site destruction by oil. However, endangered clapper and black rails are completely dependent on the salt marsh vegetation habitat for nesting, roosting, and feeding. Other species such as loons and grebes construct floating nests of sticks in estuaries. Should a spill enter an estuary, mortality could be high.

Food Losses Due to Oil Spills. The impacts on seabirds will vary with each species. For example, terns and most smaller seabirds spend a large percentage of their energy budget in foraging. Phalaropes feed in areas near upwelling where both oil and krill have a tendency to concentrate and remain. Other species such as common murres feed in large groups, possibly in traditional feeding grounds (Briggs, 1982). Brown pelicans are almost entirely dependent on anchovies (Gress and Anderson, 1982). Birds such as those described above that are concentrated for feeding, feeding on one prey species, or that spend a large percentage of their energy budgets foraging are vulnerable to local losses of food due to an oil spill, since oil from an oil spill could reduce the abundance and distribution of prey species. See Section IV.E.2.c for a more detailed discussion of impacts to fish.

Food shortages may lead to cannibalism, prolonged juvenilism or delayed productivity. In California, food shortage limits reproduction but seldom limits adult survival. Breeding colonies tend to be located where food is abundant and fluctuations are buffered. However, reproductive success decreases sharply below a threshold forage ability (MacCall). Dan Anderson reported a significant correlation between anchovy populations and breeding success in brown pelicans (Anderson and Griggs, 1982).

Estuarine habitats as used by least terns and rails could potentially be the most severely impacted. These species use estuaries for both feeding and breeding. An oil spill that entered an estuary might destroy nest sites and feeding areas for 2 to 10 years (Woodward and Clyde, 1983). Waterfowl also make extensive use of estuaries for overwintering and migration and are highly sensitive to oil. Potential impacts due to loss of food, should a spill enter an estuary, are high.

Cleanup Activities after an Oil Spill. The use of dispersants may present as great a hazard to seabirds as spilled oil. Although new dispersants have been developed that are reportedly no more toxic than the oil itself, testing on birds and mammals has been very limited. Dispersants that will break up petroleum also break up the protective oils coating bird feathers; loss of insulation and buoyancy can result, causing hypothermia and death. Impacts, should seabirds contact areas where dispersants have been used, are potentially the same as for oil contact. However, the area of ocean sprayed with dispersants will usually be much less than the area covered by an oil spill. Ultimately impacts will probably be lessened, in the event of a spill, if dispersants are used. Dispersants would not be expected to affect shorebirds or estuarine species simply because there would be less opportunity for contact.

Impacts from the noise and disruption associated with cleanup activities are discussed below.

Noise and Disruption. Increased human activity in the area can result from platform activities, pipelaying, aircraft, boats and from spill cleanup equipment and personnel. Several of the species, such as murres and brown pelicans flush easily from nests, leaving young and eggs open to predation and exposure. Mortality could range from a few percent to a large proportion of the nestlings depending on the duration and extent of the disruption. Aircraft flying at 1000 feet flush 10 percent of a nesting murre population (personal observation). The effect seems to increase in remote areas where birds are unaccustomed to aircraft. Repeated disruption may cause abandonment of a rookery by sensitive species.

In a nest area, cleanup equipment and personnel could jeopardize a sizeable proportion of a nesting population. If only the young of the year are lost, recovery of a colony could take five or more years and the impacts would be low to moderate for the colony. However, if the colony is partially abandoned due to disturbance and new sites must be located, recovery could take much longer and impacts could be high for that colony. Impacts to the California population would depend on which colony was disturbed. See Table IV.E.2.e-2 for a list of colonies of concern.

Potential Toxic Substances. The long-term effects of other contaminants to the environment from OCS oil-related activities are discussed in Section IV.A.8 and IV.E.1.a (water quality). Likely long term impacts due to drill effluents are considered very low due to the dilution factor.

Pipelaying and drilling may also stir up old sediments, releasing chlorinated hydrocarbons or other industrial wastes into the marine environment. Impacts from these chemicals on seabirds are known to be very high at times. The endangered status of the California brown pelican is due to the presence of chlorinated hydrocarbons in the environment. However, the quantities of sediments disrupted are not expected to produce significant impacts due to the small quantities involved.

PROPOSED SALE AREA

Impacts to seabirds within the proposed sale area are expected to be low since spills are not expected to contact significant seabird areas and the one spill estimated to occur will likely have low impacts on feeding birds at sea. Recovery should occur in 1-3 years.

Should the large spill (greater than 1000 bbls) estimated to occur contact land, the seabird colony of greatest concern is at Pt. Arguello. Eight percent of the Rhinoceros auklet population nests here. The probability of an oil spill contacting this area is estimated to be only two percent even after 30 days. Even should a spill occur near this colony during breeding season, impacts to the California seabird population would be low since only a small percentage of the California population nests in this area (Table IV.E.2.e-2).

The five offshore platforms and associated pipelines and facilities predicted for the basin should not significantly impact seabird colonies within the basin.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. No large spills nor any development activities are expected to occur or occur and enter Bodega, Santa Cruz or the northern Santa Maria Basins. Therefore, seabird impacts in Central California are expected to be insignificant.

There are no significant colonies in Bodega Basin. Within Santa Cruz Basin, should a tanker spill occur and contact feeding areas around the Farallon Islands or the islands themselves, impacts to California seabirds could be high to very high. (See discussion above and Table IV.E.2.e-1 and IV.E.2.e-2 for species present and sensitivity.) There are no significant (see definition) seabird colonies within the northern Santa Maria Basin.

Southern California. One spill is expected to contact the 6-mile buffer zone surrounding the northern Channel Islands. The most likely area for contact is near San Miguel. San Miguel is the most important seabird colony site in Southern California. Among other species, ashey storm petrels and Cassin's auklets nest on Castle Rock and Prince Islands nearby. Impacts would likely be locally high or regionally moderate during nesting season (February-November) due to mortality of a large portion of the colonies requiring up to 10 years for recovery of the California population.

No significant impacts to seabirds are expected from the proposal in Southern California due to platforms, pipelines, or increased human noise and disruption.

ii. Conclusions: Impacts to the California seabird population are expected to be low to moderate (mortality of the California population of a species requiring 5-10 years for recovery) due to an oil spill expected to contact the buffer zone around the northern Channel Islands. Impacts to seabirds in other areas of the state are expected to be low from oil spills.

Impacts to California seabirds from noise and disruption are expected to be very low since no structures are expected to occur near significant colonies.

iii. Cumulative Impacts: The impacting agents for seabirds are the same as those discussed in the previous section cumulative (marine mammals), IV.E.2.d.

The combined nonhydrocarbon related activities such as sewage, commercial fishing, and weather are likely to have high impacts on seabirds at some time during the next 25 years, high mortality or major reductions in reproduction would likely require 10-20 years for recovery. Increases in pollution levels would likely degrade health and reduce reproduction. Most species are expected to maintain viable populations.

Eight oil spills are estimated from hydrocarbon activities.

The 6-mile buffer zone around the northern Channel Islands and the north side of the 3 islands are the area of greatest concern to seabirds that are estimated to be contacted by spills. Three contacts are estimated for the buffer zone and one for San Miguel, Santa Rosa and Santa Cruz.

Cassin's auklets are likely to experience high local impacts due to an oil spill contacting the San Miguel area. Recovery of the colony would likely require more than 10 years. It is likely these impacts may occur more than once during the 25 years of the Proposal. High impacts to the colony would have a moderate impact on the California population of auklets since the San Miguel colony represents about 15 percent of the total. Successive oil spills would elevate the impacts at least one level.

The impacts of a single spill in any of the other likely areas would have low but significant impacts to migratory or at sea birds. A nearshore spill would probably impact sea ducks, loons and grebes. (Brown pelicans are discussed under Endangered Species.) Successive oil spills would elevate the impact levels. Recovery of most species would occur within a few years. Species with small numbers such as some of the loons and grebes might take longer.

The oil spill model estimates the Proposal (most likely scenario) will contribute one of the 8 oil spills. San Miguel is the most likely area for contact. Therefore, the Proposal is expected to contribute a large portion of the impacts.

Noise and disruption from aircraft and boats associated with the platforms projected for the Santa Barbara Channel is expected to cause some nesting dissertion and therefore loss of eggs or nestlings. Gulls and cormorants are perhaps the most susceptible since they nest in the open. Although local mortality of the young could be high, recovery would be expected in a few years. However, repeated disruption could cause abandonment of the colony with moderate regional impacts lasting over the 25 years. The contribution of the 5 platforms projected for the Proposal in the Santa Maria Basin should be small.

In conclusion, impacts to nesting seabirds are likely to be moderate due to high mortality of 15 percent of the California auklets requiring more than 10 years for recovery. Impacts to other seabirds will probably be moderate requiring a few to 10 years for the population to recover. The Proposal (most likely scenario) is expected to contribute a large amount to the cumulative impacts.

f. Impact on Endangered and Threatened Species

i. Discussion: General discussions of marine birds and mammal impact agents and levels are in Sections IV.E.2.d and e. Distribution and characteristics of whales are discussed in III.B.4. Endangered birds and mammals will be subjected to the same impact agents and levels discussed in these sections. The discussion below will point out behaviors and life histories that make the species susceptible to oil, noise, and disruption or dispersants. Those impacts not discussed below are considered potentially very low at this time.

Oil Spills. Table IV.E.2.f-1 gives the distribution of those species potentially significantly impacted. Table IV.E.2.f-2 lists the species discussed, their Endangered or Threatened status and potential, and expected impacts from oil spills.

Expected impacts or events are those specifically estimated to occur due to the Proposal. See Section IV.A.4.a for a discussion of oil spills. Potential impacts are those that might occur as a result of an unpredicted oil spill. Definitions of impact levels are found in Appendix A.

Cleanup activities, should a spill occur, may be accompanied by an increase in noise and disruption from boats, aircraft, trucks, foot traffic and use of containment equipment. Dispersants may also be used. In some cases the impacts could be highly significant. Where applicable these impacts are discussed under the individual species below.

Noise and Disruption. Estuarine birds or rodents would be highly affected by noise and disruption in the vicinity of nests or burrows. However, OCS activities are expected to occur in these areas. Therefore no additional impacts to these animals are expected due to noise and disruption. predicted levels of disruption in their vicinity.

Brown pelicans are highly vulnerable to aircraft and helicopter noise during breeding season.

Gray whales and possibly humpbacks will be subjected to noise and disruption from boats, planes, platforms and seismic activities. Should changes in migration routes and resource utilization occur due to increased activity from Proposal, low impacts would be expected (see Section IV.E.2.d.). Sea otters may experience some additional noise and disruption from these sources. It is possible that a few animals may be injured or die as a result of increased boat and aircraft traffic.

Drilling effluents. Drilling muds or effluents are not considered potentially significant for any of the endangered species due to dilution factors.

SPECIES OF CONCERN

The following discussions consider the likely impacts should a spill occur and contact significant habitat for the species. Based on the most likely oil volume scenario, these impacts are not expected to occur since no oil spills are expected to occur and contact sensitive habitat (see Section IV.A.4) or the species being considered are widely spaced so that few if any animals will be affected or the species is not sensitive to oil.

TABLE IV.E.2.f-1

ENDANGERED, THREATENED OR RARE SPECIES LOCATIONS

	Least Terns	Califorina brown pelicans	Southern sea otter	American peregrin falcon	bald eagles	Estuarine species
Bodega Basin						
Gualola River					w	
Salt Point State Park		a[2]				
Russian River		a			w	
Tomales Bluff		a				
Drakes Estero & Bay		a				
Bolinas Lagoon		a				
Rodeo Cove		a				
Santa Cruz Basin						
San Francisco Bay	b					ab[3,4,6]
Golden Gate State Park		a		f		
Half Moon Bay		a				
Pt. Sal			a			
Elkhorn Slough		a	ab			ab[3]
Salinas River		a	ab			
Santa Maria Basin						
Point Lobos		a	ab			
Morro Bay		a	ab	a[9]		ab[3,4,5,6]
Black Lake			ab			
Oso Flaco	b		ab			
Santa Maria River	b	b	b			
Purisima Point	b					
Santa Ynez River						
Northern Channel Islands						

LEGEND

a = adult concentrations
b = nesting or reproductive sites
f = possible feeding areas
m = migratory concentrations
w = overwintering areas

1. Several sites exist inside San francisco Bay for the California clapper rail, California black rail, and salt marsh harvest mouse.
2. Concentrations of brown pelicans may include large numbers of sexually immature, nonbreeding or Mexican birds.
3. California clapper rail.
4. California black rail.
5. Morro Bay kangaroo rat.
6. Salt marsh harvest mouse.
7. Belding's savannah sparrow.
8. Salt marsh bird's beak.
9. Peregrin falcon nesting sites are not released by Cal. Fish and Game to protect the birds. See text.
10. Data was taken primarily from USFWS/BLM Ecological Inventory Maps. Additional information was supplied by Bob Mallett, Ron Jurek and John Gutafson, Cal. Fish and Game.

TABLE IV.E.2.f-2

ENDANGERED SPECIES STATUS AND IMPACTS FROM OIL

	Status 8	Degree of Dispersal 1	Sensitivity to oiling 2	Likely Impacts in the event of a in large spill 3	Expected Impacts from Oil due to Proposal 4
Least terns 7	FE	mo	hi	mo(ca)	vlo
California brown pelican 7	FE	lo	hi	mo-hi(sp)	lo
American peregrin falcon	FE	hi	hi	vlo(ca)	vlo
Bald eagle	FE	hi	hi	vlo(ca)	vlo
Southern sea otter	FT	mo	hi	mo-hi(sp)	lo
Right whale	FE	hi	lo	lo(sp)	vlo
Gray whale	FE	mo	lo	vlo(sp)	lo
Other whales 5	FE	mo-hi	lo	vlo(sp)	vlo
Sea turtles 6	FE&T	hi	lo	vlo(sp)	vlo
California clapper rail	FE	mo	hi	mo-hi(sp)	vlo
California black rail	SE	mo	hi	mo-hi(sp)	vlo
Belding's savannah sparrow	SE	mo	hi	vlo(sp)	vlo
Morrow Bay kangaroo rat	FE	mo	hi	vlo(sp)	vlo
Salt marsh harvest mouse	FE	mo	hi	mo-hi(sp)	vlo
Salt marsh bird's beak				vlo(sp)	

<u>Legend</u>

1. Degree of dispersal: Low=single site, moderate=two to several sites with concentrations of animals, high=well dispersed without concentrations of animals.
2. Sensitivity of the animals should oiling occur. Low=temporary impairment of feeding behavior, moderate=impairment of breeding for a period of years, high=mortality likely.
3. Likely impacts are those impacts likely to the California population (ca) or species (sp) population if there is a large oil spill in the vicinity. The spill may be one that occurs nearby or one that occurs at some distance and travels to areas utilized by the Species. Impacts may be less than potential impacts due to inaccesibility of havitat or behavioral characteristics of species. (See Appendix A for a definition of impact levels.)
4. Expected impacts due to the proposal takes into account the number of spills expected to occur at the sites occupied by the species.
5. Other whales are the humpback, blue, fin, sei and sperm whales.
6. Sea turtle species are, green, Pacific Ridley, leatherback and loggerhead.
7. Impact level spplies to breeding colonies only.
8. F = Federal, S = State of California, E = endangered T = threatened

Least Terns. Least terns nest on sandy beaches, often in estuarine habitats. Juveniles are taught to feed in these quiet waters. Adults often feed at sea. If a large spill occurred during spring or early summer, nesting adults could become oiled while fishing. Oiled birds could contaminated young or eggs upon returning to the nest. Resulting mortality could be high. If an oil spill occurred near a least tern colony, the impacts to that colony could be locally high. However, the colonies in the southern Santa Maria Basin are relatively small.

Areas of concern within or near the Proposed sale area which are considered important in the Least Tern Recovery Plan (1977) include Oso Flaco Lake, Santa Maria River mouth, San Antonio Creek, Purisima Point, Santa Inez River mouth, Santa Clara River mouth Ormond Beach and Mugu Lagoon. Approximately 1200 least tern pairs nest in California (John Gustafson, Cal Fish and Game Field data sheet, 1982). All of the areas listed above were estimated to have less than 20 nesting pairs. Therefore, recovery time for the species should not be more than a few years. Likely impacts to the California population in the event a spill occurs and contacts significant habitat would be moderate (moderate reduction in population requiring several years for recovery).

California Brown Pelican. Pelicans are visual feeders and plunge into the water to obtain anchovies. Pelicans were observed diving into oiled waters for food about 40 percent of the time (Nero, 1982). Oiled birds and eggs have been found in the Gulf of Mexico.

Gress and Anderson (1982) reported feeding areas are usually within 30 to 50 km of the colony and CCMS (1978) reported spring concentrations occurred in the vicinity of the Anacapa nesting colony. During the summer months birds, probably mostly from Mexico, are abundant where the continental shelf is broadest. Within the area of concern concentrations were found between Pt. Conception and Morro Bay. When most abundant (October) pelicans were concentrated in the eastern Santa Barbara Channel and around shallow island shelves including Anacapa and Santa Cruz (CCMS, vol III P.88-94).

If there was a large spill in the vicinity of Anacapa Island West during nesting season, likely impacts to the species would be high due to the concentration of birds. Recovery could require 1 or 2 decades. The colony would also be sensitive to noise and disruption at that time. Impacts to non-nesting pelicans, either from Mexico or California juveniles would likely be low, recovery requiring 1 or 2 for a a 1,000 to 10,000 bbl spill due to the degree of dispersal of the animals and some avoidance behavior.

Southern Sea Otter. The sea otter is known to be highly susceptible to adverse effects from contact with oil spills or other fur soiling agents. Sea otters utilize fur and trapped air rather than blubber for insulation. Regular grooming is necessary to maintain the insulation layer. Kooyman and Costa (1979) estimated oiling of 20 percent of a sea otter's fur could result in mortality. In addition to loss of heat, oiling causes regrooming and would likely result in the ingestion of oil.

Sea otters are also highly susceptible to temporary reductions in food sources since they also rely on a high caloric intake to maintain body temperature. Mortality of invertebrates such as crabs and sea urchins from and oil spill would further increase otter mortality. Tainting of food sources would increase oil ingestion effects. See Section IV.E.2.c. for a discussion of impacts to invertebrates.

Oil spill effects would be increased in the winter season when kelp beds have died back or torn away from holdfasts. Otters tend to concentrate in the remaining kelp. Oil tends to concentrate in the same kelp. Additionally, the Davidson Current could carry oil north during the winter. (Seasonal aspects of the oil spill model take the Davidson Current into account.) Storms would limit containment and cleanup of an oil spill but allow for more rapid weathering and mixing.

Data from Cal Fish and Game (Bob Hardy, personal memo, May 1982) indicates the maximum population counts of sea otters between Pt. Estero and Pt Conception since 1977 occur in late winter (February) or early spring and have been in the range of 200 to 230 animals since 1978. During most of the year more than 80 percent of these animals are north of Pt. San Luis. However, in late winter or early spring, counts between Pt San Luis and Pt. Sal have been as high as 80 to 100 animals. In addition, Fish and Wildlife comment number 6.25 on the DEIS states,

> "Although the density of sea otters near the southern end of the range may be lower than other areas, the importance of this segment of the population may be greater than their numbers indicate. There is little evidence that the population is growing. However, the potential for growth is greatest near the ends of the range where unoccupied habitat is found. Females do not appear to be dispersing into these areas at a very high rate. Therefore, what growth there is may be attributable to this small nucleus of females that have reestablished south of Morro Bay. It has taken this group 6 years to grow from around six animals to between 20 and 25. Even a relatively small oil spill, coupled with other increased man-caused mortality, could set back population growth at the southern end of the range..... "

Over the remainder of the range, comparison of information in a draft report by Estes and Jameson (1983) and data from CCMS (1982) indicates one of the highest sea otter densities consistently occures between Piedras Blancas and Pt. Estero, 100 to 150 animals are usually counted in this 10 mile stretch of coast.

Assuming a large oil spill of 5000 bbl covers 5 nautical miles of coastline, mortality could exceed 100 animals and result in a high impact (recovery time 10 to 20 years). A very large spill, could cover much of the otter range and result in a very high impact, recovery requiring decades if at all.

Whales. Likely impacts from an oil spill are low. Endangered whales may experience some baleen or blow hole fouling due to an oil spill. Limited mortality, expecially to calves could occur resulting in low impacts requiring a few years fro recovery. Recurrent oil spill contacts to the same species would result in higher impact levels. Gray whales are known to travel through the natural oil seeps off Coal Oil Point with no reported mortality, so that even if densities of 100 whales per km^2 reported in CCMS (1978) were contacted by a spill, mortality would still be small, if any. Should a right whale baleen plate or blow hole become permanently fouled, the death of a single animal, which represents 10 percent of the year's estimated production of right whales, might take several years but would be analagous to an impact that could occur every few years due to natural causes and therefore is considered low. Current data indicates oiled gray whale baleen plates may clean themselves in a short period of time. See Section IV.D.2d. for a more detailed analysis.

Platform, boat, aircrafdt and seismic noise may disrupt utilization of preferred migration routes and habitat by whales. However, considering the present high level of human activity along most of the coast, it is doubtful that 5 scattered platforms would have serious effects. Gales' (1982) report indicates platforms produced less noise that large boats. A major concern, however, is the longevity of these impacts. Seismic activity over the life of the Proposal may increase gray whale calf mortality very slightly resulting in low impacts requiring a few years for recvery.

Guadalupe Fur Seal (Nominated Status Only). Significant impacts to the species are not likely due to the few scattered animals present in the Channel Islands.

Sea Turtles. Four species of sea turtles occur off the California coast (see Table IV.E.2.f-1). None of these turtles lay eggs on the California coast. Sightings have been of an occasional single animal at sea. Likely impacts to the species are therefore considered very low.

American Peregrine Falcon. Peregrine falcon pairs occur along the Coast at 8-10 sites including Morro Rock. The only naturally breeding pair in Central California is at Pizmo Beach. Most of the time peregrines feed by knocking down flying birds and catching them mid-air. Seabirds such as phalaropes are a common food for peregrines. However, one of the significant consequences of oiling seabirds is their loss of, or reduced ability to fly. Peregrines could be oil fouled by capturing an oiled bird. The likelihood of this is considered low. However, should oiling occur, the death of a pair of birds and loss of years clutch would have a low impact to the Central California population (recovery requiring a few years). One pair represents about 4 percent of the total breeding population. Peregrine nest sites are restricted information to protect the birds. Therefore, should a spill occur and prior to any cleanup efforts, contact should be made with the appropriate regional office of California Department of Fish and Game to determine if any nesting sites would be potentially impacted.

Bald Eagles. Bald eagles are generally carrion feeders and commonly eat salmon or dead fish washed ashore. Eagles winter northward from Napa County. Juveniles are present and feeding offshore on Catalina Island. One pair represents about 4 percent of the breeding population. Eagles could ingest fish despite contaminted with oil from a spill. However, likely impacts, in the event of a spill, are very low since it is doubtful mortality would occur due to ingestion. However, illness and loss of reproduciton for a year could occur.

Rails. California clapper rails and California black rails primarily use the upper reaches of estuaries for feeding and breeding. These areas are only seasonally subjected to high tides, therefore, they are usually inaccessible to spills. However, should a spill enter their habitat, impacts (mortality) would be high locally. Impacts to the sub-species would be moderate to high depending on the size of the colony involved. No significant colonies are known to occur within the Proposed Sale Area or nearby areas of concern.

Major colonies of light-footed clapper rails occur in Southern California but are not expected to be of concern for this sale. However, two major colonies of light-footed clapper rails also occur in Baja California with populations of about 600 birds total (Zemball and Massey, 1981). The El Estero colony, in excess of 200 birds, equaling the entire California population is in jeopardy from a proposed platform fabrication plant tentatively intended to build platforms, at least in part, for California hydrocarbon activities.

Impacts to the subspecies,should this plant be completed as planned, would be very high since their habitat would be destroyed. Although the most likely scenario with its 5 platforms may not contribute significantly to the motivation for building this plant, the total development scenario with it's estimated 30 platforms must contribute significant motivation for construction of the facility.

Belding's Savannah Sparrow. These sparrows are entirely dependent on estuarine habitats. However, they rarely are found below the mean high tide line. Should a spill enter an estuary, impacts would likely be very low.

Morro Bay Kangaroo Rat. The Morro Bay kangaroo rat utilizes sand dune habitats and is not expected to be impacted.

Salt Marsh Harvest Mouse. See rails for a discussion of impacts.

Salt Marsh Bird's Beak. This small member of the stone crop family occurs in the upper reaches of estuaries and is not expected to be impacted.

Terrestrial Species. Additional Terrestrial species should not be impacted. Most areas utilized by these species are protected by state and federal regulations. Consultation with USFWS and the State and local governments at the time of construction, should prevent impacts. In the event of an oil spill it will also be necessary to check with Cal Fish and Game and USFWS to determine if any sensitive species are located in areas where cleanup, beached bird or beached mammal crews might be working. Cleanup plans should contain provisions for avoiding sensitive species and habitats.

PROPOSED SALE AREA

Although one spill is expected to occur within the proposed sale area, no spills are expected to contact land (the highest probability for any individual land segment in Central California to be contacted by an oil spill is 7% within 30 days). Some mortality is possible for brown pelican from the one oil spill. Recovery should occur in 1 or 2 years.

Other oil sensitive species sea otter and least terms (listed in Table IV.E.2-2) are widely dispersed in the proposed sale area or stay on, or fairly close to, land and are not expected to be contacted by a spill. Endangered species in the proposed sale area are expected to experience low to very low impacts from oil or cleanup activities.

Oil Spills. Should a large spill occur near colonies, least terns would likely experience moderate impacts. A large oil spill contacting the sea otter range sould likely result in moderate to high impacts due to mortality. In the event a very large spill or more than one spill contacted the otter range high to very high impacts could result. Estuarine species and least terns would be likely to experience moderate to high impacts. Other species should not experience significant impacts.

Noise and disruption. Least terns, gray whales, the southern sea otter, California black rail and Morro Bay kangaroo rat utilize the proposed sale area (see Table IV.E.2.f-1 and 2). These species are expected to experience low to very low impacts from noise and disruption due to the Proposal.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. Since no spills are estimated (the highest probability for any individual land segment in Central California to be contacted by an oil spill is 7% within 30 days), due to the Proposal are predicted to occur in habitat used by endangered species in Central California, no impacts from oil or cleanup activities are expected for any endangered species in Bodega, Santa Cruz or northern Santa Maria Basins.

Oil spills. Should a spill occur in habitat used by least terns (San Francisco), the California population could experience moderate impacts. The sea otter would likely experience high to very high impacts due to mortality from a very large spill. (A tanker spill would probably be a very large spill.) Estuarine species could experience moderate to high impacts. Should a large spill enter San Francisco, one or more of the species would likely be impacted.

Southern California.

Oil spills. One spill is estimated to contact (26 percent change) the marine sanctuary waters around the Northern Channel Islands within 30 days due to the Proposal. Should this occur during the brown pelican nesting season, the impacts could be high. However, several circumstances would need to be present: 1) nesting season, 2) spill contact in areas of significant feeding, 3) a large slick still present after 30 days. When coupled with the relatively low likelihood of a spill in this area (26 percent chaange), high impacts are not expected. Undoubtedly some pelicans will perish with recovery probably occurring in 1 to 2 years.

Noise and disruption. Contingency plans need to consider ways of protecting the California brown pelicans on Anacapa Island from noise and disruption due to cleanup activities in the event of an oil spill.

ii. Conclusions: Impacts to endangered species from oil spills are expected to be low (small mortality requiring less than 2 years for recovery).

In the event a large (greater than 1,000 bbl) spill occurs nest colonies, impacts would likely be as follows: least terns moderate (mortality to the California population requiring up to 10 years for recovery); brown pelicans - high (recovery requiring 1 to 2 decades for recovery). Successive spills impacting the same species would increase impacts at least one level. Depending on the size and location of a spill, impacts to the southern sea otter could range from low to very high. In the event of a 5000 bbl spill, a high impact would be most likely (1 to 2 decades for recovery).

Impacts likely to terrestrial birds and mammals, in the event of a large spill occurs and contacts sensitive habitat, range from very low to very high due to behavioral and habitat considerations. Likely impacts are as follows: peregrine falcon - low for the California population; bald eagle - very low for the California population; estuarine species (clapper rails and salt-marsh harvest mouse) - high for species or sub-species. Impacts would be due to a reduction in population size due to direct mortality or loss of reproductive capacity requiring years or decades for recovery.

iii. Cumulative: Sewage disposal, increased recreational traffic, commercial fisheries, expanding population centers along the coast, habitat loss, changes in climatic conditions or other non-hydrocarbon related activities may result in changes in species abundance and distributions. Many endangered species will be limited by habitat availability rather than impacts from nonhydrocarbon related impact agents.

As a result of Alaskan and foreign tankering, existing state and federal leases, and the "most likely" scenario of the Proposal, 8 spills greater than 1,000 bbls are estimated to occur.

The oil spill model also estimates 8 oil spills will contact land within 30 days: one of these contacts is estimated to result from the Proposal. The area of concern for endangred species that is likely to be contacted by an oil spill within 30 days from the cumulative source is the 6 mile buffer zone around the northern Channel Islands which is estimated to be contacted by 3 spills.

The likely impacts from these contacts are, high impacts to the nesting California brown pelican due to high mortality requiring 1 to 2 decades for recovery. Brown pelicans may experience these high impacts more than once during the life of the Proposal resulting in very high impacts requiring decades for recovery. No oil spills are estimated to contact the sea otter range.

Since spills are also likely to contact feeding areas offshore, it is likely that Mexzican or juvenile brown pelicans will contact oil resulting in low impacts to non-California breeders. Since 8 spills are estimated it is likely contacts will occur more than once increasing the expected level of impact.

The one spill estimated to occur due to the Proposal is most likely to cause low impacts. Therefore, the Proposal is likely to contribute a small amount to the high or very high impacts on endangered and threatened species. spills.

Sixty-four platforms are projected: 32 for the Santa Barbara Channel, 21 for Central California and 11 more in Southern California as a result of existing state and federal leases and the "most likely" scenario of the Proposal. Five of the total are expected as a result of the Proposal.

This degree of activity with attendant noise and disruption from boats, aircraft and seismic activity is likely to cause a small amount of disruption to brown pelicans, sea otters and gray whales. These impacts may last for the life of the Proposal and result in some mortality.

If the El Estero site is chosed for platform construction, light-footed clapper rails will experience very high impacts.

In conclusion, cumulative impacts to endangered and threatened species are likely to be high due to high mortality to brown pelicans requiring 1 to 2 decades for recovery. Very high impacts are possible to light-footed clapper rails. .Impacts to other species will be low to moderate and require several years for recovery. Impacts caused by the "most likely" scenario of the Proposal will probably add a small amount to the cumulative impacts.

g. Impact on Estuaries and Wetlands

i. Discussion: Estuaries and wetlands are critical areas of high productivity and contain distinct assemblages of fish, birds, invertebrates, and plants. The estuarine intertidal and subtidal benthic community plays an important role in the overall ecology of an estuary. Any event which destroys a large proportion of this community in a bay will have a significant effect on other communities in the bay, such as fishes, birds, and even terrestrial mammals which depend upon salt marshes for feeding. Wetlands are important habitats for many species during at least one stage in their life cycle; examples are the California halibut, the endangered least tern, and California black and clapper rails. Geographic isolation has prevented easy genetic mixing for some species. Repopulation or restoration, once a wetland is destroyed, is slow or impossible (see Sections III.A.6, IV.E.1.a and 2.d).

From San Francisco Bay south, there are only a couple of sizeable estuaries, (Tables III.B.8-1 and 2), but these estuaries are important to the area.

Proposal-related factors potentially affecting wetlands are oil spills and possible onshore construction. The activities associated with offshore drilling and platforms are not expected to cause impacts on estuaries and wetlands. Impacts on fish, marine mammals, and endangered species of estuaries are discussed in Sections IV.E.2.c,d,e and f.

Should an oil spill occur and contact an estuary, high impacts could occur. The lack of substantial estuarine wetland habitat (except for Elkhorn Slough and Morro Bay) to the south of San Francisco Bay, is a cause for concern because there are so few areas to act as a source of brood stock or buffer against significant impacts to the adjacent ocean areas. The ocean areas are partly dependent upon estuaries for biological and nutrient resources.

Oil Spills. Although most historical data on the impacts of oil spills on estuaries comes from outside central California, the habitats are similar enough to predict that the severe impacts caused by crude oil in estuaries in other areas (Bender, et al., 1977) would also occur in California. In the event of a large spill which completely covers the surface and the tidal flats of an estuary, and remains for several days, destruction could be manifested for over 10 years. Some species within the estuary, if endemic, may be permanently eliminated. These are high (a significant interference with ecological relationships lasting for two or more years) to very high (cause a species or assemblage to become endangered or extinct) impacts (Appendix A). Artificial restocking of the habitat may also be necessary. More detailed examinations of the impacts on estuaries and wetlands can be found in BLM (1975, 1979, and 1980).

Short Versus Long Exposure to Oil. Studies on the important estuarine salt marsh communities indicate it is necessary to have large quantities of oil covering the area long enough for oil to penetrate into the sediment before high mortalities to the entire salt marsh community occur. Baker (1971a) reported most marsh seed plants recovered from light single dose coverage by crude oil although leaves were killed, eliminating primary productivity until the following season. The loss of cover or food source supplied by the leaves could cause high impacts to species dependent upon them. Evidence has also been presented which indicates actual growth stimulation of salt marsh plants due to light oiling (Baker, 1971b). Causes for this phenomenon primarily involve greater release of nutrients from killed organisms or from oil itself.

Baker (1971a) reported that heavy pollution was more damaging when there was sufficient oil to soak into the ground around the base of plants and kill their growing points, causing plant mortality. Penetration of oil into the substrate has direct effects by spreading around root systems and reducing normal bacterial activity or oxygen content. This smothers the shoots of plants such as Spartina which pass oxygen into the soil via their roots. A single heavy oiling could cause such mortality, since a significant amount of oil would penetrate into the sediment. Depending on current or wind velocities and wave energy, oil could be redeposited on the salt marsh during low tide periods allowing more oil to penetrate each cycle.

Once in the sediments of an estuary, oil can remain for years. The residence time and resulting impact depends upon the wave energy, type of substrate and vegetative cover present, and type of oil. When the substrate is heavily oiled, erosion can be increased 24 times. Population densities may continue to decrease for several years before recovery commences. Vandermeulen (1977) reported that some of the intermediate compounds during oil breakdown were more toxic than the original. It required 2 years for Spartina to begin recovery at Chedabucto Bay from a Bunker C spill (Vandermeulen, 1977). Refined oil is typically more toxic than crude, so the recovery rate reported by Vandermeulen may be longer than can be expected from a crude oil spill.

Some species in salt marshes and all seedlings of salt marsh seed plants are very susceptible to oil (Baker, 1970). Plants having shallow roots, with no food reserves are quickly killed and cannot recover except from new seeds. Pickleweed (Salicornia spp.) is such a very susceptible species. However, the California species of Salicornia occurs at the upper reaches of high tide, is not always covered at high tide, and would not be oiled except during very high tides. Pickleweed is an important component of the endangered black and clapper rails. Loss of the pickleweed habitat could have serious effects on the rails of an estuary (see Section IV.E.2.f).

Recovery from an Oil Spill. Predicting the recovery period from prolonged oil coverage of an estuary is complicated by how long the oil in the substrate remains toxic, thereby preventing or slowing repopulation. Recovery from a severe spill, if most species have been eliminated, could involve a successional sequence where preclimax species occupy a habitat, temporarily out-competing the climax species. This could cause recovery to take longer than ordinarily would be required.

According to Shenton (1973), recovery of a mud flat would require over 10 years. The important salt marsh would be effectively killed for 6 months to a year from a small coverage, but completely killed for an unknown time (until the sediment becomes nontoxic enough to sustain seed germination and sexual maturation) if the coverage is heavy and lasts several days.

The impacts on estuarine plankton will vary from low (insignificant interference with ecological relationships lasting less than a year) if only a small portion of the water surface were oiled, to high, if the entire surface were covered for several tide cycles. The larvae of benthic or fish species can be killed so subsequent years will have small populations of the year-class which was oiled.

Oil Diversion/Containment Operations. Many variables influence the success of oil diversion/containment operations. The conditions that make boom equipment ineffective are only known in a general way. Our assumptions for the physical conditions under which equipment is no longer effective are: water current velocity greater than 1.25 knots (2.11 ft/sec), surface wind velocity greater than 25 mph, or wave height 6 to 8 feet or greater. Equipment may not be effective at night or during heavy fog (see Section III.B.2).

According to Johnson (1972), no estuaries have a mean opening channel velocity greater than 1.25 knots, although several estuaries may have velocities above the critical value during certain periods of the tidal cycle. Brenna Malouf of Grover City (personal communication) cites a Coast Guard representative (Mr. Sutherland) as reporting that current velocities of over 4 knots are typical of the channel entrance into Morro Bay. According to the Chart Guide for Southern California Boating, Diving and Fishing for 1975-77, the currents in the entrance channel of Morro Bay often exceeds 5 knots (Winlund, 1976). Summer wind velocities rarely reach 30 knots in Central California (Winzler and Kelley, 1977).

Since the openings to estuaries and the protective ability of oil containment-diversion equipment is highly variable, it is necessary to generalize when discussing potential impacts of oil spills on estuarine habitats. With the use of conventional containment-diversion techniques, it is assumed that estuary openings of greater than 100 meters are extremely difficult to protect by completely sealing off once oil approaches the mouth, however diversion may still be possible. Table III.B.7-3 shows there are 4 estuaries which have "normal" openings greater than 100 meters. During the winter, when a combination of flooding and storms tend to cause the widest openings of the year, there are nine estuaries in Central California which have openings greater than 100 meters. San Francisco Bay and the Pajaro River have "normal" entrances around 300 meters or larger.

Morro Bay has a breakwater off its entrance. This forms an additional opening so an oil spill would have to cross both the breakwater and the bay entrances prior to entering the sensitive estuary. The additional entrance would allow some additional containment or diversion time.

The factor which causes one of the greatest problems in the control of a spill at an entrance is wave height. The nearshore data are limited, but deep water wave height data (tabulated at 1 degree intervals, 140 observations minimum per interval) are valuable. This is true particularly for diversion considerations, since it is most desirable to divert an oil slick before it has reached estuary entrances if the oil cannot be contained The percentage of observations of waves, 7-9 feet or greater at the most shoreward 1 degree coastal latitude gradients, together with estuaries having "normal" openings greater than 100 meters, are shown in Table IV.E.2.g-1 (U.S. Naval Weather Detachment, 1976). The 7-9 feet wave heights were used because the data were presented in those increments. These increments are less conservative than the 5-6 feet wave height used in Sale No. 53 (BLM, 1980).

TABLE IV.E.2.g-1

PERCENT OBSERVATIONS OF WAVES EQUAL TO OR GREATER THAN 7 FEET IN DEEP WATER NEAR THE COAST OF CENTRAL CALIFORNIA

Quadrant Degrees N.Lat.	Percent Observations of Waves >7 ft. January	July	Estuaries with Normal Openings 100 m
	North of Proposed Sale Area		
37 to 38	22.0	8.2	San Francisco
36 to 37	36.1	25.2	(Elkhorn Slough- 100 to 150 m opening)
	Proposed Sale Area		
35 to 36	34.5	28.2	Morro Bay
34 to 35	23.4	19.5	(Pt. Conception)

Source: U.S. Naval Weather Service Detachment (1976)

These data indicate that larger waves are more frequent during the winter. There is a slight reduction in the frequency of large waves as one moves south.

Oil containment equipment will be effective approximately 60 percent of the time around San Francisco Bay during both winter and summer. South of San Francisco Bay, oil containment equipment will be effective 64 to 78 percent of the time (average 71 percent) during the winter, and 72 to 90 percent of the time (average 79.7) during the summer.

Dispersants may be more effective at preventing an oil spill from entering an estuary, particularly if applied to the spill before it nears the estuary opening. The use of dispersants, particularly in a timely manner, is not guaranteed; however, a rigorous approval process is required before their use is allowed (see Section IV.B.2).

The extent of impacts resulting from chronic oil pollution are not well known. However, it is doubtful that an estuary will receive significantly prolonged exposure from chronic effluents to cause significant impacts. The distance from platforms to the entrance would allow dilution and weathering of the small amounts of oil that might to reach shore to both become less toxic and less concentrated. Variable currents and wind patterns would prevent most estuaries from receiving chronic oil pollution. Impacts above low are not expected to occur.

Onshore construction activities which involve any part of an estuary would cause high ecological loss to the part of the wetland involved. However, pipelines and platforms are not expected in the vicinity of the wetlands, and consequently, the likelihood of impacts are very low. For this reason, onshore construction impacts are not discussed in the analysis.

PROPOSED SALE AREA

Oil Spills. Estuaries within the proposed sale area having openings of 100 meters or greater, are Morro Bay and San Luis Obispo Creek.

Although one oil spill is predicted for the Santa Maria Basin, the probability of it reaching the entrance of an estuary is very low. Since no spills are expected to enter an estuary in the proposed sale area, significant impacts to estuaries are not expected.

If a large oil spill were to enter an estuary, the severity of impacts depends upon the areal extent of coverage and length of time the estuary remains covered by the oil. If the oil covers a significant portion of the estuary and remains for several tidal cycles, the impact will be high or possibly very high, depending on the distribution of the particular species in other estuaries along the coast. A spill covering a smaller portion of the estuary or one covering a significant portion of the estuary, but remaining for only a couple of tidal cycles, will probably cause a moderate impact. During a moderate impact a few plant species may experience a slight stimulation of growth (Baker 1971b).

The proposed sale area has only one major estuary, Morro Bay. This bay, however, is a highly productive and important bay and undoubtedly contributes to the overall ecology of the coastal ecology of Santa Maria Basin. As indicated in Figure III.B.7-1 tidal flats are located throughout Morro Bay, but most marsh habitat is located toward the head by the tributary creeks. A large oil spill entering the bay would almost certainly impact some of the tidal flat areas, but possibly be diverted before reaching the marsh area. The eel grass beds near the mouth (Figure III.B.7-2) would almost certainly be impacted by a large oil spill, although some of the main eel grass habitat impacts may be avoided. Oil entering during incoming tides would be difficult to contain or divert because of the rapid currents near the mouth of Morro Bay.

According to wave data (Table IV.E.2.g-1) containment or diversion methods would be effective 65 to 72 percent of the time before an oil spill reaches Morro Bay. The double entrance allowed by the breakwater off Morro Bay would allow additional time and opportunity to contain or divert oil away from the sensitive habitats within the estuary itself. However, the strong tidal currents (often 5 knots or greater) would prevent efficient cleanup or diversion procedures during many incoming tidal periods. A high to very high impact to Morro Bay may cause a moderate regional impact to the coastal ecology of the entire proposed sale area, but the regional impact is expected to be low.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. Estuaries within Central California having openings of 100 meters or greater are Bodega Bay, San Antonio, Drakes-Limantour Estero, Bolinas Lagoon, San Francisco bay, Rescadero Marsh, Pajarro River/Watsonville Slough and Elkhorn Slough.

Since no large spills are predicted for areas north of the Sale Area, significant impacts to estuaries are not expected.

However, if a large spill were to occur due to tankering and to enter an estuary, the impacts would be similar to those discussed above in the proposed sale area.

The regional impact to the coastal areas of Central California resulting from a high or severe impact to one of its major estuaries may be moderate.

A high impact to a major estuary could cause an abnormal amount of enrichment to the coastal region through decay of estuarine organisms killed by the spill. The regional impact from this aspect of estuarine impacts, however, should not be as important as the mortality of estuarine plants and animals.

South of San Francisco, the size of estuaries and resulting area of habitat (salt marshes, mud flats, eel grass beds, open water, etc.) decreases. The importance of estuaries, as a result, to the offshore ecology apparently is less than in the basins further north. There still are many important smaller estuaries in this basin and San Francisco Bay no doubt plays an important part in the ecology of most of the Santa Cruz area. Regional impacts to this basin resulting form a high impact to a couple of the more important estuaries could cause a moderate regional impact.

Southern California. Large spills are not predicted to reach the coast in Southern California. Therefore, impacts to estuaries are not expected.

The severity of impacts of these estuaries, if hit by a large oil spill, for an individual estuary and on a regional basis resulting from a large oil spill are similar to those discussed under the proposed sale area.

ii. Conclusions. Impacts to Central California estuaries and wetlands are not expected to occur due to the proposed action. However, if a large oil spill occurred and entered an estuary, impacts could be high to very high.

iii. Cumulative Impacts. At present estuaries within the sale area are experiencing very low impacts with localized areas within some estuaries experiencing low or moderate impacts from visitor use, boat traffic, and sewage discharge.

Oil spill related impacts from existing and future oil and gas development (OCS Lease Sales in Southern California, Sale 53 and the Proposed 1984 lease offering in Southern California) are not expected. An unknown level of impact could occur from State Tidelands development off Point Arguello. According to the oil spill model 3 large oil spills from existing oil and gas development and 4 large oil spills from tankers importing Alaska and foreign oil are expected to occur. Although these spills would increase the chance that a large oil spill will occur and contact an estuary within the sale area none are predicted to contact one. Consequently, impacts should remain very low with localized low to moderate impacts in estuaries within the sale area.

Major estuaries outside the sale area having probabilities of 25 percent or greater of a spill occurring and entering within 3, 10 and 30 days are shown below:

Estuary	3, 10, 30 Day Oil Spill Probability (%) of Occurrence and Contact
Drakes-Limantour Estero	9, 25, 36
Bolinas Lagoon	38, 43, 43
San Francisco Bay	29, 35, 35

Based upon this information, we can expect a high to very high impact on Drakes-Limantour Estero and Bolinas Lagoon in Bodega Basin with moderate regional impacts. San Francisco Bay may sustain high to moderate impacts in certain areas, but regional basin impacts will probably be low.

Since the oil spill occurrence and contact probabilities for these areas are increased by one percent or less when proposed Sale 73 is also considered, the expected impacts to these estuaries will remain the same. The estuary in Southern California that has a large oil spill occurrence and contact probability within 10 days is Goleta Slough. Since Goleta Slough has a small opening, the chance of a spill entering it is small. Impacts to Goleta Slough, should oil enter it, would be expected to be high. This impact would be unchanged by Sale 73.

The impacts to estuaries from the incremental change that Sale 73 would add will not cause an increase from the present generally very low or low and moderate impacts.

h. Impact to Areas of Special Concern

i. Discussion: The definitions for the State-designated areas of special concern are discussed more fully in Section III.B.8. These areas include marine life refuges, ecological reserves, areas of special biological significance (ASBS) and underwater parks and are designed to protect intertidal and shallow water subtidal inhabitants. Additionally, the California Sea Otter Marine Life Refuge in Central California was established to protect the sea otter populations.

Oil spills would cause impacts on the shallow subtidal and intertidal areas to the extent that is discussed in Section IV.E.2.a and b. The impacts from a large spill could be low (an insignificant interference with ecological relationships lasting less than a year) for the shallow subtidal areas and low to moderate (a significant interference with ecological relationships lasting for less than 2 years) for the intertidal areas. This conclusion is primarily based upon the large Santa Barbara oil spill (Straughn, 1970; Foster, 1974 and Foster, et al., 1971) where the impact to the intertidal was moderate.

Although most of the areas of special concern involve intertidal or subtidal benthic communities, some of the areas are important seabird or marine mammal habitats (Farallon Islands, Ano Nuevo and Northern Channel Islands). With the exception of the sea otter refuge, none of the ASBSs are considered to contain populations significant to seabird or mammal species on a regional basis. That is, impacts to the California populations would not be significant. See Sections IV.E.2.d, e and f for a discussion of impacts to these species. Impacts to sea otters, from a large spill, however, could be expected to be high. (Moderate to major reduction in the size of the California population requiring several years to decades for recovery. A high impact is the level which would be expected to occur every 30-40 years due to natural environmental conditions.) (Section IV.E.2.d and f.)

Impacts to the special designated areas could also come from pipelines. However, with the high degree of concern placed upon these areas by the State of California, it is highly unlikely that pipelines would be allowed to traverse them. Impacts associated with platform construction are not expected to occur since minimum distance of 3 miles away from these activities would be too far away to cause significant impacts.

PROPOSED SALE AREA

There are no officially designated Areas of Special Significance (ASBS) within the Proposed Sale Area, however, Morro Bay (see Section IV.E.7) has been nominated to become a national marine sanctuary.

Since no large oil spills are predicted to occur and contact a coastal area within the sale area, significant impacts from oil spills are not expected. However, if a large oil spill should contact a sensitive area within the sale area, impacts would be the same as those discussed in Sections IV.E.2.a, d,e, f and g for intertidal communities, marine mammals, seabirds, endangered and threatened species and estuaries and wetlands.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. Areas of Biological Significance are listed below:

Point Reyes Headland Reserve	Farallon Islands
Duxbury Reef Reserve	Bird Rock
James V. Fitzgerald Marine Reserve	Double Point
Ano Nuevo Point and Island	Carmel Bay
Pacific Grove and Hopkins Refuges	Sea Otter Refuge
Point Lobos Ecological Reserve	Julia Pfeiffer Burns Underwater Park

Since no large oil spills are predicted for these areas, significant impacts from oil spills are not expected. However, if a large oil spill were to contact an area of special concern, the most likely impact to the intertidal habitats would be moderate (Farallon Islands, Point Reyes, Bird Rock, Double Point and Carmel Bay) and low for all other areas. Impacts to Duxbury Reef may be high (a significant interference with ecological relationships lasting two or more years). (Section IV.E.2.a.)

Southern California. Since no large oil spills are predicted to reach an area of special concern in Southern California, significants impacts from oil spills are not expected.

However, if a large oil spill would contact an area of special concern, the most likely impact to rocky intertidal communities is moderate locally and low regionally (Section IV.E.2.h).

ii. Conclusions. Impacts to the areas of special concern in Central California are not expected to occur due to the proposed action. However, if a large oil spill occurred and contacted an area of special concern impacts to sensitive intertidal areas could be moderate to high.

iii. Cumulative Impacts. At the present time, sensitive areas of concern within the sale area remain relatively unaltered with generally localized very low and low impacts as discussed in Sections IV.E.1 and 7. Oil spill related impacts from existing and future oil and gas development (OCS Lease Sales in Southern California, Sale 53/RS-2 and the proposed 1984 lease offering in Southern California) are not expected. An unknown level of impacts could occur from State Tidelands development off Point Arguello. According to the oil spill model 3 large oil spills from existing oil and gas development and 4 large oil spills from tankers importing Alaska and foreign oil are expected to occur. Although these spills would increase the chance that a large oil spill will occur and contact a sensitive area of concern, there is no expected contacts within the sale area. Consequently, impacts to such areas should remain relatively unaltered if Sale 73 is held. Oil spill impacts are expected to occur and contact ASBSs outside the sale area. Areas of Special Biological Concern having probabilities of 25 percent or greater of a spill occurring and contacting them within 10 and 30 days are shown below:

Area of Special Biological Concern	3, 10, 30 Day Oil Spill Probability of Occurrence and Contact		
Point Reyes Headland Reserve	9	25	36
Duxbury Reef Reserve	38	43	43
James V. Fitzgerald Marine Reserve	29	35	35

Based on this information we can expect moderate to high impacts to the intertidal communities of the other areas listed above. The Drakes-Limantour Estero would experience high impacts (Sections IV.E.1 and 7).

In Southern California, the northern shores of San Miguel, Santa Rosa, and Santa Cruz Islands have 10 and 30 day occurrence and hit probabilities ranging from 29 to 43 percent. The northern shore of San Miguel Island is the habitat for several sensitive seabirds while Santa Rosa Island's northern shore contains a potentially sensitive intertidal area (Sections IV.E.2 and 6). The potential impacts to these areas would be the same as those discussed in the proposed Sale Area summaries (Sections IV.E.2.a,d,e,f and g).

Since the oil spill occurrence and contact probabilities for these ASBS are increased by 7 percent for the northern shores of San Miguel Island (for contact within 30 days) and 4 percent or less for the other areas when proposed Sale 73 is considered, the expected impacts to these areas will remain the same.

The impacts to areas of special concern from the incremental change from Sale 73 will not cause an increase in the relatively unaltered and sensitive areas within the sale area.

i. National Marine Sanctuaries

i. Discussion: There are no national marine sanctuaries within the proposed Sale Area at this time. The Point Reyes Wilderness Area/National Seashore essentially comprise the Point Reyes Peninsula from the mouth of Tomales Bay to the Point Reyes Bird Observatory a few miles north of Balanas Point (see Section III.B.g). This area, contains unaltered intertidal areas and the estuary Drakes-Limantour Estero, has similar boundaries to the marine sanctuary.

The Point Reyes/Farallon Islands Marine Sanctuary contains the largest breeding colony of seabirds in California and is an important pinniped rookery. The waters of the area are highly productive and are an important foraging area for the birds and pinnipeds.

Impacts on the nominated Morro Bay National Marine Sanctuary are given in Section IV.E.2.g-1.

In Southern California, the Channel Island National Marine Sanctuary in the Santa Barbara Channel (Section III.B.7) contains highly productive waters and bottom communities utilized for feeding by the important pinnipeds and birds which nest or breed in the Sanctuary. In addition, Monterey Bay and the surrounding area are proposed as a Marine Sanctuary and Cordell Bank, off San Francisco, has been nominated for sanctuary status.

Impacts to these species and communities from oil and gas operations will be the same as those discussed under the appropriate biological resources in Section IV. The biological resources which would be impacted by oil spills, either from smothering, oil toxicity, or fouling include seabirds, pinnipeds, estuarine communities, intertidal and subtidal benthic organisms.

PROPOSED SALE AREA

No sanctuaries exist within the Proposed Sale Area.

AREAS OUTSIDE THE PROPOSED SALE AREA

Central California. No spills are expected to occur and contact sensitive areas in Central California. However, should a tanker spill occur, the impacts are discussed below.

Central-northern California pinnipeds should experience low impacts should a single large to very large spill from tankering contact the Farallon Islands. However, due to large concentrations of sensitive seabird species, the California population of seabirds could experience high to very high impacts (15 to 30 percent mortality to the California population of several species with recovery expected to take several years to decades). See Appendix A for a further definition of impacts and Section IV.E.2.d and e for impacts to individual species.

Impacts to intertidal communities on the Farallon Islands and Point Reyes would be low to moderate (insignificant to significant interference with ecological relationships lasting less than two years). The Drakes-Limantour Estero may experience high (significant interference with ecological relationships for over 2 years) to very high (cause an assemblage or species to become endangered or extinct) regional impacts to these resources should be moderate. (See Section IV.E.f.)

The nominated Cordell Banks Marine Sanctuary would not experience significant impacts from an oil spill.

Impacts on the proposed Monterey Bay and surrounding area marine sanctuary are impossible to predict at this time because the sanctuary and exact resources of concern have not been defined. The most we can predict is that impacts would be similar to a variety of biological resources described in Section IV.E.2.

Southern California. Impacts to the Channel Islands Marine Sanctuary would primarily be due to oil spills. One large spill is predicted to occur and contact the Marine Sanctuary within its 6-mile border. No spills are expected to contact the Islands themselves the probabilities for these land segments individually ranging as high as 14% for one or more spills occurring and contacting it. Expected impacts to northern fur seals could be high during pupping season (mortality of 25 percent of California population requiring several years to one or two decades for recovery). Impacts to other pinnipeds in the Sanctuary range from very low to low (less than 2 percent reduction in the population to as high as 7 percent reduction; recovery requiring a few months to several years) due to a single spill. See Section IV.E.2.d for more detailed analysis.

The entire California population of the brown pelican nests on Anacapa Island. Should the spill occur during the breeding season and contact the Island or surrounding feeding grounds, the impacts could be high (mortality of 25 percent of the population requiring years to one or two decades for recovery). Impacts to Cassin's auklets and Ashey Storm Petrels could be low during the breeding season (2-7 percent mortality; recovery one to several years).

Expected impacts to rocky intertidal communities due to a spill would be moderate, although high impacts are possible on the northern shore of Santa Rosa Island and Santa Barbara Island. Regionally these impacts would be low.

ii. Conclusions: Impacts to the Point Reyes/Farallon Islands Marine Sanctuary and Point Reyes Wilderness Area/National Seashore are not expected to occur due to the proposed action. However, if a large oil spill reaches the marine sanctuary, moderate to high local and regional impacts may occur to several seabird species. If an oil spill occurs and contacts the Drakes-Limantour Estero within Point Reyes Wilderness Area it may experience high impacts, if the oil spill covers a significant portion of this estuary and remains for several tidal cycles. The Channel Islands National Marine Sanctuary is expected to experience impacts from an oil spill. Northern fur seals are expected to experience high impacts if a spill occurs during pupping or breeding season. If a large oil spill reaches brown pelican feeding grounds, impacts to the brown pelican may be high.

iii. Cumulative Impacts: No marine sanctuaries occur within the proposed sale area, although Morro Bay has been nominated to become one (see Section IV.E.2.a).

Oil spill impacts are expected for the Point Reyes/Farallon Islands National Marine Sanctuary and the Channel Islands National Marine Sanctuary from existing oil and gas activities and import tankering. Both these areas are relatively unaltered by human impacts. An unknown level of impacts could occur to the Channel Islands Marine Sanctuary from State Tidelands development off Pt. Arguella.

According to the oil spill model 3 large oil spills from existing oil and gas development and 4 large oil spills from tankers importing Alaska and foreign oil are expected to occur. The oil spill model predicts a probability of 68 percent of a spill occurring and reaching the Point Reyes/Farallon Island National Marine Sanctuary within 3 days of the spill. The 10 and 30 days occurrence and hit probabilities for the sanctuary are 69 and 70 percent, respectively. The land segments which the more sensitive species occupy have a 9, 29 and 38 percent 3-day oil spill occurrence and hit probability. Both the land segments and waters of the marine sanctuary are expected to be impacted by an oil spill. The impacts to the sanctuary biological resources should be similar to those discussed above (also see Sections IV.E.2.a,d,e,f and g).

The Channel Islands National Marine Sanctuary has a 3, 10, and 30 day occurrence and hit probability of 73, 91 and 93 percent, respectively, from existing OCS oil and gas activities and crude oil import tankering, and is consequently expected to be impacted. The impacts from a single oil spill hit will be the same as described above.

The number of spills expected to occur and contact the Channel Islands National Marine Sanctuary are one, within 3 days of the spill, and two within 10 days, and three within 30 days from existing activities and crude import tankering. Multiple spills, contacting the same area would increase the likelihood of high ecological impacts to all biological resources discussed above (see Sections IV.E.a,d,e,f and g).

The Channel Islands are a national park. The probability of a large oil spill occurring and contacting an island within 10 days ranges from 29 to 43 percent from crude tankering or imports and existing activities No spills are expected from these activities to contact the Islands within 3 days. The impacts to the biological communities of these islands will range from moderate to high (see Sections IV.E.a,d,e,f and g).

Since the oil spill occurrence and contact probabilities for the national marine sanctuaries and the land segments of their inner boundaries are increased by seven percent (the northern shores of San Miguel Island) or less when proposed Sale 73 is considered, the expected impacts for these areas will remain the same.

3. Socioeconomic Environment

a. Coastal Economy

i. Discussion: OCS activity from Proposed Sale No. 73 would result in changes in employment and earnings in Central California. These changes would impact local onshore areas depending upon the location of OCS facilities and the place of residence of new workers.

This section will identify the changes in employment and earnings and the effect on local employment which would result from the proposal.

Employment associated with the sale is identified as direct, indirect, and the induced. The sum of the direct, the indirect, and the induced employment makes up the change in total employment associated with the sale. From the total employment, the local and permanent employment were estimated.

Direct employment consists of those workers involved in oil and gas exploration, development, production and other OCS-related activities. Indirect employment resulting from the primary oil and gas extraction activities occurs in secondary (pipeline layers, marine mechanics, etc.) industries. Induced employment is tertiary (store clerks, waiters, etc.) employment resulting from both direct and indirect employment which occurs in non-oil and gas industries. Local employment is the estimated number of jobs expected to be filled from local labor pools. Permanent employment is the number of jobs associated with OCS oil and gas production, support facilities and related maintenance needs after exploration, development and installation of platforms and pipelines have been completed.

During the exploration and development phases, many jobs would be filled by outside labor already under contract with oil companies. Normally, oil companies operate on an extended shift of 7 days on with the following 7 days off or 28 days on and the following 28 days off. Workers usually remain onboard the exploratory vessel or on the platform during their extended shift and return to their place of residence (outside the sale area) on their days off. The use of this arrangement will minimize the impacts on local public facilities.

Local employment is expected to be used to the maximum extent possible. It is assumed that about 25 to 50 percent of the OCS-created jobs would be filled by local residents at each phase of OCS activity. Local labor may be used in both temporary and permanent positions.

Historical data on employment and earnings by industry were obtained from the California State Employment Development Department and the U.S. Water Resources Council, OBERS Projections. From these figures projections were made to develop a base case scenario without the sale. Labor force base case projections were made to the year 2010 and base case projections on earnings to the year 2020.

Direct employment projections with the proposal are based on the estimated exploration, development, production, platforms, pipelines, and support facilities in accordance with the Most Likely Find Scenario. Projections with the proposal were developed for the 1983-2007 period. An industry- and region-specific gross output multiplier system was used to project the changes in earnings and the indirect/induced employment expected to result from the proposal.

The Regional Industrial Multiplier System (RIMS) used in support of the economic analysis in this section was developed by the Bureau of Economic Anaylsis, U.S. Department of Commerce. The total regional economic effect of Proposed Sale No. 73 is composed of an initial impact and a secondary impact. RIMS requires that the initial change introduced into the economy because of the sale be defined in terms of an initial change in the final demand of a set of industries. The secondary impact is estimated using the industry- and region-specific multipliers. The product of the initial change and the multiplier provides an estimate of the change in total gross output. The sum of the changes in each affected category represents the total regional impact from the sale (Fernandez, 1983). The following analysis of impacts from Proposed Sale No. 73 consists of a discussion of impacts from development of Alternative 1.

The peak year (1990) employment gain expected from development in the Santa Maria Basin is estimated at 1,405, a 0.62 percent increase over the base. The change in permanent employment would be 487, a 0.17 percent increase. Local employment during the peak year would be 466, a 0.2 percent increase. The estimated change in permanent local employment is 222, a 0.08 percent increase. Table II.C.1-1 provides information on employment by decade between 1980 and 2010. Impacts on employment would be less than 1 percent increase over the base, a very low impact on the study area. Tables IV.E.3.a-1 and 2 provide additional information on employment impacts from the proposal.

The change in earnings as a result of development in the Santa Maria Basin is estimated at $90.9 million, an increase of 2.2 percent over the base (1990). This represents a very low impact on the study area (an increase of 1 to 3 percent over the base). Table IV.E.3.a-3 provides additional information on changes in earnings as a result of Proposed Sale No. 73.

ii. Conclusions: OCS activity from Proposed Sale No. 73 would have an insignificant stimulating effect on employment and the regional economy. Total employment impacts from Alternative 1 are expected to be very low (an increase of 1 to 3 percent over the base). Changes in earnings for the sale area would be very low (an increase of less than 1 percent over the base).

iii. Cumulative Impacts: As a result of offshore oil and gas development from State (575 jobs) and Federal (2,121 jobs) leasing activities and activity from other ongoing non-OCS related projects in the region, the coastal economy is expected to experience an increase in employment. This would result in a general expansion of the economy in affected areas, expected impact to be moderate (a 3 to 5 percent increase over the base). Through the local coastal programs (LCPs) communities along the coast are able to manage residential and industrial development, as well as the use of land resources in their area. Consequently, affected communities possess the ability of controlling the extent and location of onshore economic growth that could result from OCS development along the study area coast.

TABLE IV.E.3.a-1

DIRECT AND TOTAL EMPLOYMENT DUE TO PROPOSED SALE NO. 73
(MOST LIKELY)

Year		Year	
1983a	109	1990a	812
1983b	190	1990b	1,405
1984a	254	1991a	705
1984b	444	1991b	1,302
1985a	254	1992a	300
1985b	444	1992b	487
1988a	425	2007a	300
1988b	729	2007b	487
1989a	725		
1989b	1,251		

[a] Direct Employment

[b] Total Employment

TABLE IV.E.3.a-2

YEARLY LOCAL EMPLOYMENT
(MOST LIKELY)

Year	Santa Maria Basin
1983	61
1984	143
1985	143
1988	252
1989	422
1990	466
1991	425
1992	222
2007	222

Source: MMS, Pacific OCS Region Estimates, 1982.

TABLE IV.E.3.a-3

CHANGES IN SELECTED ECONOMIC COMPONENTS OVER THE BASE
(MOST LIKELY)

Wholesale/Retail	Services	Finance Insurance, and Real Estate	Transportation	Earnings
41,944,000 6.7	12,672,000 1.2	17,048,000 7.5	3,249,000 1.2	90,942,000 2.2

Source: MMS, Pacific OCS Region Estimates, 1982.

b. Demography

i. Discussion: The impacts on demography have been evaluated in terms of the change in population because population change is the greatest impact agent, and population estimates are the most readily available of demographic projections. Other demographic parameters (racial characteristics, education, age, family size, etc.) are expected to become more like the national average as population increases. Some demographic characteristics that are expected to move toward the national average are presented in Table III.C.2-2.

The determination of the permanent increase in population was done by assuming that for each job filled by an immigrant worker, population would increase by 2.75 people, or for every 100 new jobs, population would grow by 275 people. "Economic Impacts of Proposed OCS Sale No. 73 Offshore Central California" (Fernandez, 1983) explains the procedure used to determine the changes in population resulting from Proposed OCS Sale No. 73.

During the peak year of development (1990), population is expected to increase by 1,405 people in the study area, or an increase of 0.31 percent of the 1980 population. The permanent increase in population is expected to be an additional 729 people or an increase of 0.16 percent over the 1980 population of 454,005.

The impacts from the proposal on the two county study area are very low, however the largest level of impacts are expected to occur within commuting distance of areas in which crew and supply facilities are located. Port San Luis, Gaviota and/or some other location between the two are expected to serve as staging areas for supply and crew boats. To determine the level of population which could be impacted from siting of facilities in the above areas, a commuting distance of 30 miles from each location was determined and the expected change in population from the proposal was compared to the population in the commuting area.

There are 149,532 people in the Port San Luis commuting area, and 238,099 people in the Gaviota commuting area. The total population for the commuting area is 387,631 or 85.4 percent of the two county study areas population. Proposed Sale No. 73 is expected to result in a 0.36 percent increase in the commuting areas 1980 population in the peak year (1990), and a 0.18 percent increase in the commuting areas 1980 population on a permanent basis. In the unlikely event that all the peak population change were to settle in either of the commuting areas, the increase over the 1980 population would be 0.94 percent and 0.59 percent for Port San Luis and Gaviota respectively. This level of impact is considered to be very low.

No significant adverse population impacts are expected on the study area, commuting area, or community level as a result of Proposed Sale No. 73. No significant community level impacts are expected because of the expected dispersal of a relatively small increase in population. In addition to the dispersal of the population increases, the boom and bust syndrome often accompanying onshore development is not expected to occur with offshore development, because the majority of temporary labor is housed offshore, either on platforms or drill ships. The temporary population increase which is not accommodated by offshore living arrangements are expected to reside in motels, hotels, and other temporary housing.

The level of changes expected from this alternative are very small and may be included in the projection of changes in population, prepared by the State of California. All population related impacts, however, were assumed to be over and above those that would occur in the future without the proposal. Table IV.J.3-3 shows the expected change in population without the proposal.

ii. Conclusion: The increase in the study area population is expected to be 0.31 percent of the population base in the peak year (1990). The permanent increase in population as a result of this alternative is expected to be 0.16 percent of the 1990 population. Increases in population of the magnitude expected are considered to be very low.

iii. Cumulative Impacts: Cumulative impacts of this proposal, other projects, and the general population increase expected by the State of California will result in an additional 198,495 people between the years 1980 and 2020 in the study area. OCS development is expected to account for 5,832 or 2.9 percent of the increase in population. Other projects, such as State tideland leasing (1,300), expansion of Vandenberg Air Force Base (8,500), and the Point Conception LNG facility (9,263) are expected to add 19,063 people to the study area. The contribution to population growth from these other sources is 3.3 times as high as Federal OCS development.

c. Impact on Public Service and Facilities

i. Discussion: This section will discuss the possible impacts to the water supply, wastewater treatment systems, onshore transportation systems (roads, airports, railroads), and power generating facilities from the proposed action. Other public facilities and services (e.g. schools, parks, police and fire protection) are not discussed. These facilities and services are impacted by population increases. As discussed in IV.E.3.a, Demography, population increases associated with OCS development from this proposal will be insignificant (less than 0.5%) when considering overall expected population growth.

Proposition 13, passed by California voters in 1978, has seriously impinged upon the local jurisdictions' ability to respond to changing demands for public services and facilities by reducing local government's ability to raise revenues. The impact of reduced revenue availability is just now being felt with reduced levels of services, budget deficits, and reduced government employment. The long-term impacts of reduced funding on services and facilities in terms of maintenance, repair, upgrading, or new construction may result in even further reduced services, more frequent system breakdowns or failures, or moratoria on new connections.

Water supply, wastewater treatment facilities, onshore transportation systems, and power generating facilities may be impacted during all phases of exploration, development, and production for offshore oil and gas. The following is a discussion of the impacting agents.

Exploration. Demand for water is generated by the possible need to supplement the drilling vessels' onboard desalinization capabilities, and provide water to crew and passengers on crew and supply boats for drinking, food preparation, sanitation needs, and personal hygiene. The temorary supply base will need water for sanitation needs, cleanup purposes, to supply water to the supply and crew boats, and to provide for the needs of any local office facilities. The office may be located at the base and use the supply base water hookups, or if located elsewhere, it will require local water service.

Wastewater disposal facilities, e.g., sewer hookups, will be needed at the supply base for the base employees and disposal of supply and crew boats' wastes. The local office may either use the base facilities or require service from the local service company. These facilities may be permanent installations or temporary accomodations, e.g., trailers, portable outhouses.

Transportation systems may be impacted by increased traffic. Increased traffic on roads may be caused by local employees traveling to and from work, and by truck traffic bringing in supplies to the supply base. This increased traffic could result in increased numbers of traffic accidents and an increase in the rate of road deterioration, thus, increasing costs to the local jurisdiction. Air traffic may be impacted by increased numbers of helicopter flights originating from local airports or from the increased demand for airline flights from non-resident employees. Rail traffic may be impacted from increased demand for rail surface to bring in large amounts, or bulky supplies or equipment to the supply bases.

Electrical power will have to be provided to the supply base, and to any local offices. Drilling vessels provide their own power.

These impacts will continue for the duration of the exploratory drilling effort. A well takes 50 to 80 or more days to drill, depending on the well depth and the water depth. Crew and supply boats may make 1 trip every 2 days, depending upon the distance between the drilling vessel and the supply base or crew embarkation point.

Development. During development, the sources of impacts remain basically the same as for exploration. Water demand can be generated by the need to supplement a platform's desalinization equipment. Crew and supply boats, and pipeline-laying barges will require water for onboard uses. A permanent supply base may be established, with more employees, thus, requiring more water. A larger local office, either located at the supply base or elsewhere, may be established.

Wastewater disposal facilities needs are the same as for exploration, but permanent sewer connections and other facilities would be required.

Transportation impacts would be the same as for exploration, but may be increased as more employees, supplies, and equipment are needed during the development phase.

Additional electrical power might be required for the supply base. In addition, power may be supplied to a platform via a pipeline if the platform is close enough to shore.

Production. The production phase usually overlaps with the development phase and the services and facilities provided during development would be sufficient to accommodate production phase needs.

Once the original development phase has ceased and the field is in production, many of the requirements for public services and facilities would be greatly reduced because of a reduction in the number of employees and the need for supplies.

Water may or may not be needed to supplement the platform's desalinization capabilities. With lower levels of activity, fewer crew and supply boat trips are required, thus, less need for onboard water. The size of the supply base may be reduced and the number of employees also reduced, requiring less water than in the development phase.

No new wastewater treatment facilities or connections would be needed.

Lower levels or activity, that is fewer employees and reduced supply needs, would result in fewer impacts on transportation systems, but the same type of impacts would occur as discussed above.

The following resources would be subject to impact and the reasons why they may be impacted are discussed below.

Water Supply. Offshore development and related onshore facilities potentially demand large amounts of water. (Refer to Table IV.E.3.d-1.) In many areas of Central California, the water supply is limited or the water delivery system is stressed to near capacity (refer to Chapter III.C.3). Continued overdrafting (removing more water from the water source than is replaced) may cause subsidence, reduction in water quality and, in coastal areas, saltwater intrusion. Any increased demand might further stress existing supply systems or decrease water availability for other new uses, domestic or industrial.

Wastewater Treatment Facilities. Existing sewage or wastewater treatment facilities in parts of Central California are at or near capacity. Temporary moratoriums on new service hookups have been instituted in some towns. Other areas have adequate facility capacity to meet existing needs and to accommodate increased future needs. Generally, only urban areas are served by treatment facilities, rural areas and some urbanized areas are dependent upon septic tanks and leach lines. Suitable disposal sites for septic tank waste material are difficult to find and develop. Additional demands for wastewater disposal or treatment could strain already limited existing systems.

Transportation. Vehicle access to the coast is limited from Gaviota in Santa Barbara County up to the San Luis Bay Cities. A large portion of this section of the coast is controlled by Vandenberg Air Force Base. Access to the rest of the coast is via Highways 1 and 101. Both highways carry increased amounts of traffic during the tourist season. Increases in truck traffic, such as might be required to deliver supplies to local facilities associated with OCS development, could contribute to increased traffic congestion, especially in the summer months, and accelerate highway deterioration.

The degree of impact from this proposal on airports is dependent upon the airports' capacity to absorb new uses or increased traffic. Several of the airports are small and recreationally oriented, with little opportunity for industrially related growth. At all airports, traffic, both passenger and aircraft, increases on weekends and holidays indicative of itinerant or tourist use. The need to establish helicopter bases to service offshore platforms may impact some airports causing displacement of current users. A positive impact could be the additional revenues generated for the airport operator (local government or private) from use fees.

Rail transportation of supplies and equipment would be feasible to San Luis Obispo and Santa Barbara counties (Santa Maria Basin) as the Southern Pacific Railroad tracks parallel the coastline from Santa Barbara to the San Luis Bay Cities. North of there, the line heads inland and follows approximately the same path as U.S. Highway 101. New railroad sidings may have to be constructed to accommodate rail delivery of OCS related supplies and equipment.

Power Generating Facilities. The demand for electricity to service OCS related onshore facilities is not expected to cause any impacts. Existing supplies are adequate to meet any expected needs. Offshore platforms and drilling vessels are self-supporting, using large diesel engines to supply their power needs.

Overall expected impacts to public services and facilities throughout the Proposed Sale area would be moderate to very low, depending on the service or facility. Water supply and wastewater treatment facilities would experience moderate impacts, ie. local systems will experience stress. Transportation systems impacts would be low to very low, that is no significant impacts to airports or railroads and limited localized stress to traffic facilities and traffic patterns. There would be no significant (very low) impact to electrical power generation facilities. Airports and railroads under transportation and electrical power generating facilities will not be discussed further as no significant (very low) impact is expected from the proposed sale.

PROPOSED SALE AREA

The development scenario for the southern portion of the Santa Maria Basin predicts five platforms generally located off the southern San Luis Obispo County and northern Santa Barbara County coast. No new onshore processing facilities or marine terminals are predicted; it is assumed that adequate capacity will exist as a result of previous OCS sales. A supply base located in or near the western Santa Barbara Channel is assumed to exist and would serve as a crew and supply boat base for development from the proposal. Port San Luis also would be used as a crew boat base.

The increases in the general population is expected to cause the most significant impacts to public services and facilities. OCS related population increases are expected to be very small, less than 0.5% of the expected population growth. Therefore any impacts by OCS related population increases would be masked by the impacts of the general population growth.

Impacts could be expected to occur from energy related developments. Impacts in San Luis Obispo County would be caused by the development of a crew base at Port San Luis. All other facilities are assumed to be already in existence.

The water supply at Avila Beach is adequate to meet current needs and allow for some growth. Establishment of a crew base would increase the demand for water and hasten the time when demand exceeds supply. Purchase of water from an outside source could allievate the problem. Impacts to the water supply at Avila Bay would be high, potentially significant short-term and minor long-term stress on the water supply.

The access road to Port San Luis is experiencing heavy levels of use especially during the tourist months. Traffic from the platform or rig crews and the boat crews would add to the existing traffic levels. This would result to a moderate impact to road traffic, a short-term disruption of transportation patterns.

Impacts to wastewater treatment capacity would be very low, no significant stress on local facilities. Avila Beach has an adequate capacity in the existing plant to accommodate expected needs.

Impacts in Santa Barbara County would for the most part occur out of the proposed sale area and are discussed below. Impacts to the Santa Maria and Lompoc areas would occur from increasing population. Even though the general population growth would mask the impacts of OCS related population increases, an impact level of moderate must be given. This is because any increase in the demand for water, no matter how small, has serious consequences in these regions. Water supplies are very limited and each region is overdrafting the groundwater basins.

Impacts to wastewater treatment capacity would be very low, no significant stress as these plants are relatively new and will excess capacity into the 1990's.

Impacts to transportation system would be very low, no significant impact. Highways 101 and 1 provide adequate access to this area.

Generally impacts to public service and facilities will be moderate from the proposed sale.

AREAS OUTSIDE THE PROPOSED SALE AREA

No impacts to public services are facilities are anticipated outside the proposed sale area to the north (northern portion of the Santa Maria Basin), nor to services and facilities to the south (Santa Barbara Channel), with the possible exception of water delivery systems and wastewater treatment facilities. If a new supply base is not built in the western Santa Barbara Channel, supply boats would continue to use Port Hueneme as their base. This could cause minor short-term stress at the Port, a low impact, on existing water delivery systems and wastewater treatment facilities by increasing or prolonging current use. If a base is built in the western Channel, then moderate impact may occur to local water delivery systems as water for the base would be drawn from sources that are currently being overdrafted.

ii. Conclusions: Overall, the impacts to public services and facilities would be moderate, i.e. short-term stress of local systems that may be accommodated through time and with small use adjustments. Expected impacts to water supply systems would be high for the proposed sale area (significant short-term and some long-term impacts requiring modification of existing systems or construction of new facilities). Impacts on wastewater treatment facilities would be low for the proposed sale area, some localized stress. Impacts to transportation systems (roads) would be low in the sale area (minor short-term stress on local systems) with moderate localized impacts at Avila Beach. Impacts to the electrical power supply, and air and rail transportations would be very low, or no significant impact.

iii. Cumulative Impacts: For this cumulative impact analysis the following impacts from other activities and proposals were considered. Imacts from previous lease sales (Sales 53, 68, 48, 35) and State oil and gas development all have similar impact on public services and facilities. Development of onshore facilities would require water and access to wastewater treatment facilities. Transportation systems should have little impact except for road systems. The State sale is to be held offshore of an area with few roads, and would require road construction or improvement even if only to lay a pipeline. Development on Vandenberg Air Force Base has been, and will be, the primary reason for growth in the Santa Maria and Lompoc areas. This growth is significantly impacting the water supply. Wastewater treatment capacity is adequate for the near future but significant capacity deficits may occur starting in the 1990's (BlayneyDyett 1981).

Continued adequate water supply is currently the most significant problem facing county and local jurisdictions. Both San Luis Obispo and Santa Barbara Counties have entitlements to water from the State Water Project. Access to this water requires the construction of aqueduct from Kettleman City in the Central Valley to San Luis Obispo and then to Santa Barbara County. So far, voters in neither county have been willing to incur the indebtness necessary to build an aqueduct. In 1979 Santa Barbara voters rejected a bond issue for construction of the necessary aqueduct.

Impacts from construction at the proposed Liquified Natural Gas (LNG) facility at Point Conception could vary from low to high depending upon when construction actually starts. If construction of the LNG facility begins at the same time as construction at Vandenberg is declining then impacts would be low as a shift in workers from one project to the other could be expected. But if construction starts earlier then impacts could occur from new population moving into the area to take advantage of the jobs offered. At this time, construction of LNG facility has been postponed for an unknown length of time.

Areas of both Counties are currently overdrafting the ground water basins, and increased demands for water from offshore and onshore development, and associated commercial and housing growth could increase the amount of overdrafting. Continued overdrafting of the ground water supply could lead to subsidence, salt water intrusion, and lowering of the water table (Blayney-Dyett, 1981).

Southern San Luis Obispo County could experience, and may be experiencing, spillover growth from the activities in northern Santa Barbara County. People desiring to live in a beach community may settle in or near the San Luis Obispo Bay cities and commute to jobs at Vandenberg AFB, the proposed LNG site, or other development activity. The City of Santa Maria, as an urban focus or center, could expand northward with development occurring in San Luis Obispo County. All this growth could cause increased overdrafting of water supplies from the Arroyo Grande groundwater basin. Wastewater treatment is adequate to accommodate some growth.

Expected development from this proposed sale would add a small increment to the overall impact. The impact from the proposed sale, when considering all other proposals, would be low or some localized stress of a minor nature. The cumulative impact from all proposed development in northern Santa Barbara County and southern San Luis Obispo County could be high (short-term stress and some long-term stress requiring modification of existing systems or construction of new facilities) to water delivery systems.

Impacts from the proposal to wastewater treatment capacity when considering the other projects and general population growth would be low. Cumulative impacts from all the proposals and activities and general population growth will be high because of the need to expand existing facilities starting in the 1990's.

The incremental impacts to transportation systems and electrical power will be low or very low from this proposal. Impacts to these services may be moderate, short-term stress on systems because of projected population increases. Local high impacts may be experienced to road systems in the Santa Barbara North Coast and to Avila Beach as these areas have either limited access or are already experiencing stress from heavy traffic conditions.

d. Impact on Coastal Land Use

i. Discussion: This discussion of the impacts to land use is limited, for the most part, to lands within the coastal zone as defined by the California Coastal Act of 1976 (CCA). Land use within the coastal zone is regulated by California Coastal Commission approved Local Coastal Programs (LCP) and Port Master Plans.

Primary impacts on land use will result from the demand for land for support facilities necessary for the exploration, development, production, and transportation phases of OCS oil and gas activity. In addition, there may be secondary impacts caused by demands for changes in existing land use to support any population increases resulting from OCS operations. While expected to be insignificant in terms of demands for land use changes caused by general population increases, OCS related population increases will add a small increment to that demand.

It is important to realize that any onshore development (industrial or other) resulting from the proposal that occurs within the coastal zone would be subject to the land use controls of the local jurisdictions. It should also be noted that oil and gas related land development is dependent upon the amount of hydrocarbons discovered and developed.

The most significant impact agents to coastal land use is the construction of support facilities whose use is necessary in the development of offshore oil and gas. These support facilities have different requirements in terms of the amount of land required and the need for harbor facilities. The information presented below and in Table IV.E.3.d. on the needs of onshore support facilities is based on the NERBC/RALI Factbook (Nov. 1976).

Land based development includes temporary service bases that are staging areas from which equipment, supplies, and personnel can be ferried by supply boats and helicopters to offshore rigs during the surveying and exploratory or development drilling stage. Permanent service bases are set up as development and production phases get underway with a commercial find. Permanent bases perform the same functions as temporary bases, the principal differences are the size, and the intensity and amount of activity.

Repair and maintenance yards may be required to provide services for offshore vessels and equipment. These yards require locations accessible to road, rail, and air transportation. It is unlikely that such yards catering specifically to the needs of the petroleum industry would be newly sited in a frontier area. It is expected that these services could be rendered by existing marine repair capacities which could experience expansion pressures in a direct relationship to the amount of offshore activity.

Bases supporting platform and pipeline installation may be located separate from or contiguous to service bases. These bases would require flat land for waterfront warehouse space, pipe-coating yards, service/maintenance facilities for the vessels and barges, and possibly land for a helipad. Pipelines and landfalls would be required for bringing the oil onshore. Landfalls require a 50-100 foot right-of-way, and, if needed, a pumping station or a marine terminal. Land use impacts are dependent upon whether the pipeline would cross marshes, sand spits, beaches, open fields, or urban areas.

Depending on the location and size of the offshore hydrocarbon find, how the oil and gas will be transported, and the ultimate destination of the hydrocarbons, the following facilities may need to be constructed onshore: oil and gas processing and treatment plants, marine terminals, or refineries. Oil and gas processing plants require relatively flat terrain, located reasonably close to the pipeline landfall (within 2 or 3 miles) to minimize pipeline construction, and near a marine terminal if the oil is to be tankered. If oil is shipped via pipeline, there is less need for coastal location of facilities.

Marine terminals require flat land for oil storage tanks, and ocean frontage to accommodate ships for dock side loading or loading from a floating mooring. Refineries require 1,000+ acres of flat, cleared, industrially zoned land with access to rail and port facilities and highways.

Platform fabrication yards require flat well drained acres with unrestricted access to the ocean. Industrially zoned cleared land is preferred to allow for maximum flexibility in design and construction layout.

No new platform fabrication yards, refineries, or repair and maintenance yards are expected to be developed as a result of this proposed sale. Existing facilities would be able to accommodate anticipated industry needs with minor

TABLE IV.E.3.d-1

LAND AND WATER REQUIREMENTS OF
ONSHORE DEVELOPMENT

	Land Required (acres)	Harbor Required yes/no	Wharf/length/ water depth (ft)	Water million gal/year
Temporary Service Base	5-10	Yes-all weather	200/15-20	5.2/rig
Permanent Service Base	50-75 flat	Yes-all weather	400/15-20	8.2/platform
Crew Base	1-3	Yes-all weather	100-500/15-20	----
Repair & Maintenance yd.[1]	Similar to a Supply Base			
Bases Supporting Pipeline and Platform Installation	5-10	Yes	200-400/15-20	5/platform or pipeline
Pipelines/Landfalls	50-100 ft. Row[2] 40-60[3]	NA	NA	NA
Processing Facilities				
Partial Processing	15/100,000 bbls processed	NA	NA	0.12
Gas Processing & Treatment	50-75	NA	NA	73
Marine Terminals	30-200 (waterfront)	NA	NA/50-60	
Refineries[1]	1000-1500 flat	NA	NA	3832.5
Platform Fabrication Yds[4]	400-800	Yes	[5]/15-30	36.5

[1] No new facilities are anticipated from this proposed sale, only possible expansion or modification of existing facilities.
[2] Right of way width.
[3] 40 acres if a pump station is needed, 60 acres for a marine terminal.
[4] Steel Platform Fabrication Yard, requirements for a concrete platform are less.
[5] Sea access 200-350 feet horizontal and vertical clearance.

Source: NERBC Factbook 1976, Minerals Management Service 1983.

expansion or modification.

The impact from the demand for coastal land for facilities necessary for oil and gas development, may have a variety of effects and, depending upon the area, these impacts could be significant. If the demand occurs in an area not already zoned industrial, there would be a change in the character of the land and this would require plan amendments to existing zoning plans (LCPS and General Plans). This could also remove land from renewable resource production, i.e., agriculture or grazing.

Generally, limited amounts of land in the coastal area are zoned for industrial use or Coastal Dependent Industry, and so, commitment of this land to oil and gas related facilities would reduce the amount available to other industries. Development of oil and gas facilities within the coastal zone could also increase the number of pollution sources, both air and water (See also Water Quality IV.E.1.a and Air Quality IV.E.1.c.).

The other major impacting agent to land use is population increase and its associated conversion of land to urban uses for housing, commercial, and public services and facilities (see also IV.E.3.c). Housing availability in coastal California is limited in all price ranges but especially in the low and moderate ranges. Increases in population from employees in OCS development related jobs would increase the demand for housing in all price ranges.

This may result in the conversion of rural or semi-rural acreage to urban housing. Along with land conversions to housing uses, there will be conversions to commercial uses and to public services and facilities (i.e., schools, water treatment plants) uses. Table IV.E.3.d-2 shows the anticipated increase in housing needs based on anticipated population increases associated with OCS development. As discussed in Demography (IV.E.3.a), population increases associated with offshore oil and gas development are expected to be very small when viewed in terms of the overall general population increases.

Regionwide, the impacts to housing availability are expected to be very low, a less than 1 percent increase in the total need for housing from OCS related population growth when compared to the expected population growth. (See IV.E.3.a and b and Fernandez (1983) for demographic and economic impacts and analysis.) No further analysis of housing will be done.

The following discussion of impacts utilizes the Transportation Scenario No. 1 (Yamasaki, 1983) as a reasonable estimate of what might occur if the expected resources are found. The transportation scenario is to provide a commonality for discussion purposes, there are no recommendations made or implied. The information presented was developed from local coastal plans and from discussions with local planners. See also IV.A.5, IV.A.6, IV.E.3.c, k to o, and Yamasaki (1983) for more detailed information on transportation and related information.

PROPOSED SALE AREA

The development scenario for the southern portion of the Santa Maria Basin suggests placement of five platforms, located off southern San Luis

TABLE IV.E.3.d-2

PROJECTED NEW HOUSING NEEDS
CENTRAL CALIFORNIA

Total Number of Housing Units[1]	Population Theoretically Accommodated by Existing Housing[2]	Number of Additional Units Needed to Accommodate:		% of Increase 1980 to 1990:		% Increase in Housing From OCS Developmen
		1990 Pop. Est. Without the Proposal[3]	1990 Additional Population From the Proposal[4]	Without Proposal	With Proposal	
396,098	1,049,659	28,770	509	7.3	7.4	0.1

1 Bureau of Census, 1980 Census Figures.

2 Multiply number of housing units by the regional average household size.

3 1990 est. population without the proposal minus 1980 accommodated population dived by regional household size.

4 1990 population estimate with the proposal minus 1990 population estimate without the proposal divided by the national average household size (2.75).

Source: Bureau of Census, State of California, Minerals Management Service

Obispo County and northern Santa Barbara County coasts. Transportation Scenario No. 1 proposes two pipelines to transport oil and gas ashore. One pipeline would connect the more northerly platforms and come ashore in San Luis Obispo County near the Santa Maria River. The other pipeline would connect the southerly platforms and come ashore at Point Conception. It is assumed that adequate onshore facilities would be in place as a result of previously held sales, thus, no new facilities are proposed.

The following facilities are currently in various planning stages and are assumed to be in place to serve the needs of hydrocarbon development resulting from this proposed sale: 1) onshore coastal pipeline from Nipomo Mesa to Gaviota, 2) a supply base at Gaviota, 3) a modern marine terminal at Gaviota, 4) processing facilities at Gaviota, 5) an onshore or offshore oil pipeline from Gaviota to Los Angeles, 6) offshore to onshore pipelines serving existing platforms and connecting to existing onshore pipelines or facilities and 7) an onshore pipeline from Point Conception to Gaviota (Yamasaki, 1983).

The single new facility expected to result from this proposed sale is the establishment of a crew base at Port San Luis. Heavy equipment and large quantities of supplies are to be handled out of existing (Port Hueneme) or assumed existing (Gaviota) western Channel facility or supply bases. A crew base at Port San Luis is an allowable use under the San Luis Obispo County's Local Coastal Program (adopted 10/13/81).

Development of a crew base at Port San Luis would require a Development Plan which must include a detailed examination of alternate sites from Port San Luis south to the Santa Barbara Channel, a phasing plan for development, oil spill contingency plans, a fire protection plan, and an identification of necessary buildings and facilities and potential siting locations. This last item is to conform with County policy to site all but the most necessary industrial facilities away from the coastline.

In addition, any harbor improvements would have to be done so as to minimize conflicts with recreational and commercial fishing uses. Studies of the feasibility of improving the present level of facilities and moorage for recreational and commerical fishing boats is required. No service (crew) base would be permitted north of Point San Luis unless alternate sites are more environmentally damaging or environmental impacts are mitigated to the maxium extent feasible.

Compliance with established county policies would minimize the land use impacts of establishing a crew base at Port San Luis. No other new development, other than connecting pipelines, is anticipated. Pipelines from offshore to onshore would utilize rights of way of assumed existing pipelines at Point Conception and near Nipomo Mesa. No new rights of way, that is, a new location for a right of way, is anticipated. Pipelines are permitted uses in all land use categories, with consideration given to protection of the environment and pipeline safety (i.e., seismic, oilspill). Expansion of existing or assumed existing facilities may occur as a result of this sale, but no land use impacts are anticipated as expansion would occur according to existing County policies and within previously designated (zoned) industrial areas. Impacts to land use from this proposed sale to Santa Maria Basin area will be low, that is some incompatibility with existing land use that may be mitigated through land use plans and the permitting process. Localized moderate impacts, moderate imcompatability with the existing uses, may occur to Port San Luis from the development of a crew boat base. If a crew boat base is developed elsewhere, it may result in localized high impacts, highly incompatable uses with industry and other uses, since from Port San Luis south to Point Conception alternative sites are not readily discernible.

AREAS OUTSIDE THE PROPOSED SALE AREA

Additional land use impacts may occur outside the planning area if a platform fabrication yard is deemed a feasible development. Several large construction firms and oil companies have investigated, or are investigating, the possibility of locating a platform fabrication yard on the West Coast to deal with the potential demand for platforms from development off Alaska and off of California. To date, no yard has been built. A French firm is currently investigating the possibility of locating a yard near Ensenada, Mexico. The use of gravel islands in Alaska OCS development and the few number of platforms proposed for offshore California development may limit the economic feasibility of constructing a base on the Pacific Coast.

ii. Conclusions: Impacts to land use in the Santa Maria Basin area will be low (some incompatibility with existing land uses that would be mitigated through land use plans and the permitting process). Localized impacts varying from moderate to high depending upon location would occur from the development of a crew boat base in the Basin.

Impacts to housing availability would be very low, a less than 1 percent increase in the need for housing for OCS related population growth, when compared to overall expected population growth.

iii. Cumulative Impacts: Whether or not Proposed Sale No. 73 occurs, land use would continue to be impacted. General population increases in all regions would continue the pressure to convert non-urban land uses to urban uses. The proposal would not significantly add to that pressure, since it would only increase the demand for new housing in 1990 from OCS related population growth by less than 1 percent. Developments and construction at Vandenberg Air Force Base have been the major growth inducing factor for the Santa Maria and Lompoc areas. Growth in this area has also occurred because of the price differential between available housing in the North County and that available along the coastal areas of Santa Barbara County. If the proposed Liquified Natural Gas (LNG) facility is constructed at Point Conception, (currently postponed to some undetermined date) then the LNG facility will be a major growth inducing factor. Impacts from this development may be lessened if construction does not start until construction at Vandenberg is being phased down. In this way construction workers could move from jobs at one facility to jobs at another. This would reduce the potential in flow of job seekers to the area.

Development from previous federal sales, the upcoming state sale and existing activity in State and federal waters would have land use impacts. Processing facilities would need to be expanded and possibly new ones built. Possible location for a new processing facility constructed as a result of previous sales would be at Nipomo Mesa next to existing energy related industrial activities (an existing oil refinery). A supply base is proposed for the western Santa Barbara Channel. For the purposes of cumulative analysis in this EIS, only one consolidated facility is assumed to be in existence. The Las Flores Canyon consolidated facility, or any other location, is an equally feasible location. No recommendation as to the eventual location of a consolidated facility is made or implied. A consolidated supply base would have to be large enough to have storage tanks for oil storage prior to shipping out via the marine terminal or pipeline, room for equipment and supply storage, office space and possibly a helipad. Gaviota has existing oil related uses, i.e. oil storage tanks, marine terminal, old worker residences. And consolidation of adjacent facilities would allow the development of this facility with some expansion beyond existing uses. This would require land use changes and probably amendments to the county's LCP. All of this energy related development would result in a moderate impact to coastal land use and land use in general. The proposal would not significantly add to this impact on land use as OCS development needs from this proposed sale would be accommodated by facilities built as a result of earlier sales.

Overall the cumulative impact to land use and housing from this proposal would be low (some incompatibility that can be mitigated through existing land use plans and the permitting process). The impact to coastal land use and housing supply from all sources, Vandenberg, general population growth, the LNG facility, expansion of oil processing facilities, and development of support bases, would result in an high impact, high incompatible use between industry and existing uses or zoning and conversion of open space to urban uses for coastal land use.

e. Impact on Commercial Fisheries

i. Discussion. Oil spills, manmade structures, and vessel traffic potentially can impact commercial fishermen. However, the commercial fishing industry consists not only of fishermen but people who work in associated support, processing, transportation and marketing jobs. Thus, impacts to fishermen may cause impacts to other parts of the commercial fishing industry. The overall significance of impacts to the commercial fishing industry will depend on the magnitude of the economic loss to the entire industry (see definitions of impact level in Appendix A).

It is important to note that commercial fish harvests fluctuate dramatically under existing conditions, and any decrease or increase in the size of commercial fish harvests resulting from the proposal probably will be difficult to detect.

It is also important to note that many preventative measures already exist or are proposed to protect commercial fisheries (see Sections II.A.1.e, II.A.1.f and IV.B). Since commercial fishermen may sustain economic losses even with these measures in place (see analysis below) there are three funds available to fishermen for compensation: 1) the Fishermen's Contingency Fund; 2) the Fishing Vessel and Gear Damage Compensation Fund; and 3) the Offshore Oil Spill Pollution Fund (see Sections II.A.1.e and IV.B).

Oil Spills. Offshore oil and gas activities sometimes result in an accidental release of oil. These oil spills potentially can cause economic losses to commercial fishermen by: 1) reducing the total available catch; 2) tainting marine organisms; 3) contaminating fishing gear and vessels; and 4) preventing fishermen from leaving port.

Reducing the Total Available Catch. Oil spills potentially can reduce the total available catch by reducing fish or invertebrate populations (see discussions in Section IV.E.2.a-c). The greater the reduction in available catch, the more likely it is that fishermen will sustain economic losses.

Tainting Marine Organisms. Direct coating or incorporation of hydrocarbons potentially can cause tainting of marine organisms (particularly shellfish), rendering them undesirable or unmarketable. Since fishermen (including mariculturists) may need to move the shellfish to clean water before marketing them so that the shellfish can cleanse themselves, moderate economic losses to commercial fishermen for about one month could occur if a large oil spill occurs and contacts important shellfish areas. Fishermen (other than mariculturists) could also sustain moderate economic losses for about one month if they choose to fish another area temporarily due to concern for harvesting tainted fish or shellfish.

Contaminating Fishing Gear and Vessels. Oil spills also potentially can cause economic losses to commercial fishermen (including mariculturists) by contaminating fishing gear and vessels. Since oiled vessels probably would need to be cleaned, and oiled gear probably would need to be cleaned or replaced, moderate economic costs to commercial fishermen for about one month could occur if a large oil spill occurs in an important fishing area that fishermen continue to fish. Fishermen (other than mariculturists) also could sustain moderate economic losses for about one month if they choose to fish another area temporarily due to concern that their gear and vessels will be contaminated.

Preventing Fishermen from Leaving Port. If a large oil spill contacts a fishing port, fishermen could be prevented from leaving port by oil containment booms as occurred during the 1969 Santa Barbara oil spill (see Mead and Sorenson (1970)). This could result in very high economic losses to fishermen during the period the oil spill hits shore, and may force a few fishermen out of business.

Manmade Structures. During oil and gas exploratory operations, exploratory drilling rigs will be used and temporary abandonments (temporarily abandoned subsea wellheads) may be left on the seafloor. During development and production operations, platforms, subsea completions (wells connected by pipelines to a platform or part of a subsea completion system), subsea pipelines, marine terminals, and other manmade structures may be used (see discussion in Section IV.A.5). Also, although MMS regulations prohibit the disposal of debris, a small amount may accidentally be lost, particularly in adverse weather. In harbors, crew and supply bases will be needed during all phases of oil and gas activities.

Exploratory drilling rigs, temporary abandonments, platforms, subsea completions, marine terminals, and debris potentially can cause economic losses to fishermen by resulting in lost fishing space, time and gear. The fisheries most likely to have significant conflicts with these offshore structures are the commercial trawl fisheries, but purse seining may have some conflicts (see discussion in Centaur Associates, Inc., 1981). Since most manmade structures are required to be marked by a suitable aid to navigation, fishermen usually can avoid these structures. During exploratory operations, an area about 5 times the water depth of the rig will be precluded from fishing due to anchor lines and buoys. Assuming an average of about 305 meters (1000 ft.) water depth, this is roughly a radius of 1.6 km (one mile) around each rig that will be lost to fishing or an area of roughly 8 square km (3 square miles). This loss will be while the rig is in place, about 3 months. During development and production, a maximum of .4 km (.25 miles) around each platform or subsea completion will be lost if fishermen choose to observe the payment criteria of the Fishermen's Contingency Fund (see Sections II.A.1.e and IV.B). Assuming a 107 meter (350 ft.) long platform, the area precluded from fishing by each structure will be about .8 square km (.3 square miles). However, if a large number of these structures are placed in important trawl grounds, fishermen may attempt to fish close to these structures. This activity could result in lost fishing time and gear since fishing nets could be damaged or lost if the nets hang up on these structures. Similarly, lost fishing time and gear could result if fishermen's nets hang up on debris. Thus, exploratory drilling rigs, temporary abandonments, platforms, subsea completions, marine terminals, and debris could result in a small economic loss to fishermen if a large number of these structures are placed in important trawl grounds.

Of greater concern are subsea pipelines since they often traverse a large area. Until recently, pipelines in California have created very few problems for commercial fishermen since fishermen are able (and often choose) to fish over the pipelines. However, commercial fishermen in the Santa Barbara Channel expressed concern about fishing in one area due to wood collars used to hold pipelines together while the pipelines were laid. This method of laying pipelines is no longer used. Also, commercial trawl fishermen in the Santa Barbara Channel have not been able to fish another area (31 square km, 12 square miles) for three years as a result of pipeline laying activities.

Fishermen have not been able to trawl this area because their nets hang up on anchor scars (mud mounds and trenches) created by anchors from the pipeline lay-barge. Although OCS Order No. 9 (see Sections II.A.1.e and IV.B) requires that pipelines be installed and maintained to be compatible with commercial trawl gear, it is not clear what needs to be done differently in the future to avoid the problem, although pipelines laid after the one discussed above have not caused any problems. It is also not clear whether this problem is likely to occur in the proposed sale area. However, it is assumed that this problem may occur if a large number of miles of pipeline are laid, since parts of the proposed sale area have sediments similar to sediments near the Southern California pipeline discussed above. MMS plans to fund a study this year to answer these questions.

At the same time, platforms can provide benefits as navigational aids and places to obtain emergency help in case a vessel is disabled or a crewman injured. Platforms also could be used for mariculture operations (particularly for growth of mussels). Although production platforms and probably other offshore structures act as artificial reefs that attract fish (Carlisle et al., 1964; Simpson, 1977), this most likely will have a slight impact on most fish populations and may not benefit fishermen since oil companies generally discourage fishermen from anchoring or otherwise floating next to a platform.

In harbors, competition between the oil and gas industry and commercial fishing industry potentially can occur for: 1) port space; 2) labor; and 3) fuel and repair facilities. The significance of these impacts will depend on the specific port used to support offshore oil and gas activities.

Vessel Traffic. Oil and gas operations usually use tankers, supply boats, crew boats, and geophysical vessels (see Section IV.A.6 and Yamasaki (1983)). These vessels will cause some conflicts with commercial fishing boats. A large number of vessels could cause a small economic loss and a very large number of vessels could cause a moderate economic loss since fishermen will need to maneuver around them if these vessels cut across the fishermen's intended path (instead of avoiding the fishing boats). In foul weather, additional vessels traveling through an area can become a significant hazard, particularly if they do not maintain safe speed levels. The cable pulled behind geophysical vessels also can cause conflicts with fishing boats. This cable is usually about 3.2 km (2 miles) long and precludes fishing in the area while geophysical work is being conducted. Also, the cable sometimes becomes entangled with stationary fishing gear such as crab pots resulting in disruption or loss of the fishing gear (when the buoy is separated from the pot). The pots remain on the bottom catching crabs that eventually die in the traps, decreasing the number of crabs available to fishermen until releases on the traps decompose . Although these impacts have been significantly reduced recently by establishing communications between the oil and gas industry and the fishing industry, the potential still exists for a small amount of gear loss if a large number of geophysical vessels are operating, and a moderate amount of gear loss if a very large number of geophysical vessels are operating.

Also, fishermen have reported that after a geophysical vessel passes through an area, they catch fewer, if any, fish. Thus, fishermen are concerned that the acoustic signals may frighten fish and cause them to disperse or spook them. Dispersed and spooked fish are more difficult to capture. Although not known with certainty, this type of behavioral change is expected to be localized and short-term (see discussion of fish frightened by explosives in Rulifson and Schoning, 1963). Therefore, noise from geophysical vessel operations is not expected to significantly frighten fish unless, perhaps, a very large number of geophysical vessel operations occur at one time. Based on current limited availability of these vessels, this is very unlikely to occur. However, if a very large number of geophysical vessels are used, it is assumed that fishermen could sustain small economic losses for a few days due to noise frightening fish.

PROPOSED SALE AREA

The proposal is expected to result in moderate (10-20 percent) economic losses to trawl fishermen in the proposed sale area for at least three years due to pipeline laying activities and low (less than 10 percent) economic losses due to navigation hazards or lost fishing space primarily during years of peak activity. Other fishermen are expected to sustain low economic losses, primarily during years of peak activity, due to navigation hazards or gear loss.

Oil Spills. Commercial fishermen are not expected to sustain significant economic losses in this area due to oil spills.

Commercial fishermen are not expected to sustain significant economic losses due to a reduction in total available catch since little, if any, reduction in commercial fish or invertebrate populations is expected as a result of the proposal (see Sections IV.E.2.a-c). However, although unlikely, if a large oil spill occurs and contacts a large school of northern anchovies, a small 1-2 year reduction in northern anchovy populations contacted could result. Since anchovy stock is widely distributed and any decrease in stock is expected to be small, anchovy fishermen are not expected to be significantly affected by decreases in northern anchovy populations. Also, although unlikely, if a large oil spill occurs and contacts Pacific herring spawning grounds, a moderate reduction in the Pacific herring populations contacted, lasting 3-5 years, could occur. Since competition for herring resources is not particularly high, these decreases in herring populations are not expected to significantly affect herring fishermen.

Commercial fishermen are not expected to sustain significant economic losses from oil tainting marine organisms, contaminating fishing gear and vessels, or preventing fishermen from leaving port since: 1) the probability that a large oil spill will occur and contact important shellfish areas (potentially resulting in tainting) is very low even after 30 days (e.g., 2 percent Cayucos mariculture operations, 2 percent Morro Bay oyster fishery); 2) the probability that a large oil spill will occur and contact important fishing areas (potentially resulting in contamination of fishing gear and vessels) is very low even after 30 days (e.g., 7 percent Port San Luis (Avila) area); and 3) the probability that a large oil spill will occur and contact a fishing port (potentially resulting in fishermen being prevented from leaving port by oil containment booms) is very low even after 30 days (e.g., 2 percent Morro Bay, 7 percent Port San Luis (Avila)). However, although unlikely, if a large oil spill contacts important shellfish or fishing areas, fishermen could sustain moderate economic losses for about one month (see discussion above). Also, although unlikely, if a large oil spill contacts a fishing port and fishermen are prevented from leaving port by oil containment booms, fishermen could sustain very high economic losses during the period the oil spill hits shore, and a few fishermen may be forced out of business (see discussion above).

Manmade Structures. During exploratory operations, a peak of seven exploratory and delineation wells are expected to be drilled in one year. No temporary abandonments are expected. Assuming that all seven wells are drilled at one time (although drilling probably will be staggered), and assuming 8 square km (3 square miles) will be lost around each structure (see discussion above), 56 square km (21 square miles) of fishing space will be precluded by these structures while the structures are in use (about 3 months). This represents about 1.0 percent of the proposed sale area. Although unlikely, if all of these structures are concentrated in prime (greatest effort) trawl grounds, trawling could be precluded in 9.0 percent of the prime trawl grounds for 3 months. These calculations do not account for the tendency of trawlers to fish along depth contours, or debris that may be lost. However, even when these factors are considered, the total fishing area lost will be roughly the same. Thus, fishermen are expected to sustain small economic losses for about 3 months during exploratory operations due to space loss.

During development and production operations, five platforms, 228 miles of subsea pipelines, and an unknown amount of debris are expected to be placed in the proposed sale area. No subsea completions or marine terminals are expected. Assuming that .8 square km (.3 square miles) will be lost around each platform (see above discussion), 4 square km (1.5 square miles) of fishing space will be precluded by these structures over the life of the proposal. This represents about 0.1 percent of the proposed sale area or 1.0 percent of the prime trawl grounds. Thus, the total fishing area that will be lost is very small and fishermen are not expected to sustain significant economic losses due to lost fishing space from platforms. However, since a large number of miles of pipeline are expected to be placed in this area, it is assumed that anchor scars from the pipeline laying process will preclude trawl fishing in an important fishing area. This preclusion is expected to cause a moderate economic loss to trawl fishermen in this basin since trawling is concentrated in relatively few areas. Based on experience with the Southern California pipeline discussed above, fishermen are expected to be precluded from fishing this area for at least 3 years. Therefore, trawl fishermen in the proposed sale area are expected to sustain moderate economic losses for at least 3 years due to pipeline laying acivities. The trawl fishery in this area landed approximately two million dollars worth of fish during 1981 (the most recent year for which comprehensive data is available). When the contribution of the support, processing, transportaion, and marketing industries are considered, using a multiplier of 3.1, the value of the trawl fishery in the proposed sale area is $6.2 million.

At the same time, the 5 platforms are expected to provide a small benefit to commercial fishermen as navigational aids and places to obtain emergency help.

Port San Luis (Avila) is expected to be used as a crew base for oil and gas activities resulting from the proposal. Centaur Associates, Inc. (1981) concluded the following with respect to the use of Port San Luis (Avila):

"OCS crew and supply boats could anchor or moor in Port San Luis without causing conflicts between fishing vessels. Common usage of fuel facilities would occur but congestion would be minimal. There is not adequate diesel or electronic labor in the area to service the OCS vessels. Services would have to be contracted to labor outside Port San Luis. Marine repair facilities would probably not be used in the area. Adequate labor is available to the commercial fishing industry, as most fishing vessels are part-time or owner operated. One site has the potential to be developed and service the offshore industry. This particular site would be best suited for smaller OCS vessels such as crew boats. Development costs would be very high.

Therefore, use of Port San Luis (Avila) is expected to create minimal impacts to commercial fishing, but development costs for the oil and gas industry are expected to be very high.

Vessel Traffic. Tanker traffic in this area is expected to include a peak of 39 round trips per year from the marine terminal at Gaviota. Supply boat traffic is expected to include one round trip every other day per well site during exploration, one round trip per day per platform during development and one round trip every other day per platform during production. Crew boat traffic is expected to include one round trip per day per well site during exploration, one round trip per day per platform during development, and one round trip every other day per platform during production. Geophysical vessel traffic is expected to include an unknown number of trips per year. Since this is a large number of vessels, fishermen are expected to sustain small economic losses from navigation hazards and small economic losses from fishing gear losses, primarily during years of peak activity (see discussion above). The fisheries expected to sustain fishing gear losses are the fixed gear fisheries: rock crabs taken by pots and halibut taken by trammel nets. In 1981, the rock crab fishery in the proposed sale area landed about $0.12 million worth of shellfish and the trammel fishery for halibut landed about $0.2 million worth of fish. When the contribution of the support, processing, transportation, and marketing industries are considered using a multiplier of 3.1, the value of the rock crab fishery in the proposed sale area is about $0.4 million and the value of the trammel net fishery is about $0.6 million.

AREAS OUTSIDE THE PROPOSED SALE AREA

Commercial fisheries outside the proposed sale area may be vulnerable to impacts from: 1) oil spills that originate in the proposed sale area or along tanker routes; 2) manmade structures built to support oil and gas activities in the proposed sale area such as crew and supply bases; and 3) vessel traffic between the proposed sale area and ports outside the proposed sale area.

Central California. North of the proposed sale area, commercial fishermen are not expected to sustain significant economic losses.

Oil Spills. Commercial fishermen are not expected to sustain significant economic losses due to oil spills.

Commercial fishermen are not expected to sustain significant economic losses due to a reduction in total available catch since little, if any, reduction in commercial fish or invertebrate populations is expected as a result of the proposal (see Sections IV.E.2.a-c). However, although unlikely, if a large oil spill occurs and contacts the mouths of rivers where salmon concentrate, a moderate reduction in the salmon populations contacted , lasting 5 years or more, could result. Since competition for limited salmon resources is already very high, this reduction in salmon populations could force a few salmon fishermen out of business. Also, although unlikely, if a large oil spill occurs and contacts Pacific herring spawning grounds, a moderate reduction in the Pacific herring populations contacted, lasting 3-5 years, could occur. Since competition for herring resources is not particularly high, these decreases in herring populations are not expected to significantly affect herring fishermen. In addition, although unlikely, if a large oil spill occurs and contacts a large school of northern anchovies or squid, a small 1-2 year reduction in the anchovy and squid populations contacted could result. Since anchovy and squid stocks are abundant and any decrease in stocks are expected to be small, anchovy and squid fishermen are not expected to be significantly affected by decreases in these populations.

Commercial fishermen are not expected to sustain significant economic losses from oil tainting marine organisms, contaminating fishing gear and vessels, or preventing fishermen from leaving port since: 1) the probability that a large oil spill will occur and contact important shellfish areas (potentially resulting in tainting) is very low even after 30 days (e.g., 0 percent Drakes Estero mariculture operations, 1 percent Elkhorn Slough mariculture operations, 1 percent Monterey Bay mariculture operations); 2) the probability that a large oil spill will occur and contact important fishing areas (potentially resulting in contamination of fishing gear and vessels) is very low even after 30 days (e.g., 1 percent Monterey Bay area); and 3) the probability that a large oil spill will occur and contact a fishing port (potentially resulting in fishermen being prevented from leaving port by oil containment booms) is very low even after 30 days (e.g., 0 percent Drakes Bay (Pt. Reyes), 0 percent San Francisco Bay ports (Richmond, Berkeley, Sausalito, Oakland, San Francisco), 0 percent Princeton, 1 percent Santa Cruz, 1 percent Moss Landing, 0-1 percent Monterey). However, although unlikely, if a large oil spill contacts important shellfish or fishing areas, fishermen could sustain moderate economic losses for about one month. Also, although unlikely, if a large oil spill contacts a fishing port and fishermen are prevented from leaving port by oil containment booms, fishermen could sustain very high economic losses during the period the oil spill hits shore, and a few fishermen may be forced out of business.

Vessel Traffic. Tankers (a peak of 39 round trips per year from the marine terminal at Gaviota) are expected to cause a minor increase in vessel navigation hazards during years of peak activity. Gear loss from geophysical vessels is not expected to be significant since the cable probably will not be extended behind the vessels when the vessels pass through this area.

Southern California. South of the proposed sale area, commercial fishermen are not expected to sustain significant economic losses.

Oil Spills. Little, if any, impact from oil spills is expected since the probability of a large oil spill occurring and contacting this area is low even after 30 days (e.g., 14 percent northern half of San Miguel Island, 4 percent northern half of Santa Rosa Island, and 0-2 percent for all other areas). However, although unlikely, if a large oil spill occurs and contacts important shellfish or fishing areas, fishermen could sustain moderate economic losses for about one month. Also, although unlikely, if a large oil spill contacts a fishing port and fishermen are prevented from leaving port by oil containment booms, fishermen could sustain very high economic losses during the period the oil spill hits shore, and a few fishermen may be forced out of business.

Anchovy and squid fishermen are not expected to be significantly affected by decreases in stock since these stocks are widely distributed and any decrease is expected to be small.

Manmade Structures. Manmade structures are not expected to significantly affect Southern California fishermen since the only new structure expected in this area is a supply boat base at Gaviota, a facility that commercial fishermen do not use (the Gaviota marine terminal is expected to be built as a result of previous oil and gas lease sales).

Vessel Traffic. Tankers (a peak of 63 round trips per year from the marine terminal at Gaviota) and supply boats (see discussion above) are expected to cause a small increase in vessel navigation hazards during years of peak activity. Gear loss from geophysical vessels is not expected to be significant since the cable probably will not be extended behind the vessels when the vessels pass through this area.

As a result of all proposed activities discussed above, trawl fishermen in the proposed sale area are expected to sustain moderate (10-20 percent) economic losses for a least three years due to pipeline laying activities and low (less than 10 percent) economic losses due to navigation hazards or lost fishing space, primarily during years of peak activity. Other fishermen are expected to sustain low economic losses primarily during years of peak activity due to navigation hazards or gear loss. Since no effect on secondary employment (fish processing plants, etc.) is expected, the overall regional impacts on commercial fisheries are expected to be low.

ii. Conclusions. The proposal is expected to result in moderate (10-20 percent) economic losses to trawl fishermen in the proposed sale area for at least three years, and low (less than 10 percent) economic losses to trawl and non-trawl fishermen primarily during years of peak activity. No effect on secondary employment (fish processing plants, etc.) is expected. Overall, the expected regional impacts on commercial fisheries are low (less than a 10 percent economic loss to the industry).

However, although unlikely, the proposal could result in a moderate impact to the commercial fishing industry (a 10-20 percent economic loss) if a large oil spill occurs and contacts: 1) the mouths of rivers where salmon concentrate (causing a reduction in salmon stock for 5 years or more and forcing a few salmon fishermen out of business), or 2) a fishing port (and fishermen are prevented from leaving port by oil containment booms during the period the oil spill hits shore, forcing a few fishermen out of business).

iii. Cumulative Impacts: Without the proposal, commercial fishermen are expected to sustain economic losses due to natural fluctuations in fish and shellfish populations, competition with foreign fishermen, changes in market conditions, restrictions on fish harvests, increasing fuel, labor, maintenance, and vessel costs, existing and proposed offshore oil and gas leases (State and Federal), tanker transportation of foreign and Alaskan crude oil imports, and other vessel traffic (see Sections I.C., III.B.1, III.B.2, III.B.3, III.C.5, III.C.6, III.C.12, IV.A.4, IV.C.3 and IV.D for descriptions of these actions).

Natural fluctuations in fish and shellfish populations, competition with foreign fishermen, changes in market conditions, restrictions on fish harvests and increasing fuel, labor, maintenance and vessel costs probably are the most important stresses on commercial fishermen. Fishermen unable to find fish and shellfish on a regular basis suffer high economic losses and some may be forced out of business. Competition with foreign fishermen exists for certain products. Fishing restrictions to protect fisheries resources for the future increase costs for fishermen. Limited entry restrictions limit the opportunities and options for fishermen to switch fisheries. Operating costs are often high. However, one of the most important needs of a fisherman is a market to sell the fish he captures. At present, the price paid to fishermen for the fish they catch is often low due to the low demand for many species. However, the commercial fishing industry is optimistic that the fishing market will increase in the near future due to increased awareness of fish products by health-conscious Americans. This, although the fishing industry will continue to sustain operating losses, expansion to some new areas and products is anticipated.

Oil spills from existing and proposed leases, tanker transportation of foreign and Alaskan crude oil imports, and other vessel traffic potentially could also be an important stress. Over the life of the proposal, 3 large and many small oil spills are expected to result from existing federal leases (in the Santa Maria Basin and Southern California). Also, 4 large and many small oil spills are expected to result from tanker transportation of foreign and Alaskan crude oil imports. Based on the Oil Spill Risk Analysis Model, the areas expected to be contacted (by large oil spills) are near San Francisco Bay (Tomales Bay to Princeton) and the Santa Barbara Channel (mainland coast and northern halves of San Miguel, Santa Rosa and Santa Cruz Islands)(see Section IV.A.4.a). Other areas also may be contacted by oil since: 1) one large oil spill is expected from the Proposed Southern California Lease Offering, February 1984 (Minerals Management Service, 1983), 2) additional oil spills (number unknown) are expected to result from existing and proposed oil and gas development in state tidelands, and vessel traffic other than tanker transportation of crude oil imports, and 3) additional oil (amount unknown) is expected to be released as a result of sewage disposal and natural oil seeps. The cumulative effect of oil from all of these sources is expected to result in: 1) a moderate economic loss to some commercial salmon fishermen due to a reduction in salmon stock for 5 years or more, and 2) very high economic loss to commercial fishermen at at least one port during the period that a large oil spill hits shore since fishermen could be prevented from leaving port by oil containment booms (see discussion above).

Many manmade structures exist or are expected to be placed in California waters as a result of existing or proposed offshore oil and gas leases (State and Federal) (see Sections IV.C.3 and IV.D.4 for details). In the proposed sale area and adjacent State waters, 13 exploratory wells have been drilled and, in the future, 70 exploratory and delineation wells, 507 development wells, 16 platforms, 4 subsea completions, and other structures are expected to be needed. Also, a small number of temporary abandonments and debris exist or are expected in these areas. Assuming that the 70 remaining exploratory and delineation wells will be drilled over the next four years (due to the length of the leases), 18 exploratory wells may be drilled in each year. Although unlikely, if half of these 18 wells are drilled at one time, 72 square km (27 square miles) of fishing space will be precluded by these structures while the structures are in use (about 3 months). This represents about 1.0 percent of the proposed sale area and adjacent State waters or 11.0 percent of the prime trawling grounds that would be lost for 3 months. Thus, the total fishing area lost will be significant and fishermen are expected to sustain small economic losses due to lost fishing space during exploratory operations.

During development and production operations, the fishing space lost due to platforms and subsea completions is expected to be very small (0.2 percent of the proposed sale area and adjacent State waters, 2.4 percent of the prime trawling grounds). However, pipelines from this activity are expected to cause a moderate economic loss to trawl fishermen for at least 3 years since not all problems have been resolved with at least one existing pipeline in the Santa Barbara Channel, and it is possible that similar problems may occur with another pipeline when laid (see discussion above). At the same time, platforms provide a small benefit to commercial fishermen as navigational aids and places to obtain emergency help.

Vessel traffic from existing and proposed leases, tanker transportation of foreign and Alaskan crude oil imports and other ships usually creates low navigation hazards to fishing. Geophysical vessel operations from existing and proposed leases are expected to cause a small amount of fishing gear loss (see discussion above).

The cumulative effect of all of these stresses, particularly non-OCS related stresses, is expected to cause high economic losses to the commercial fishing industry. The proposal is expected to add a significant (small) amount to these losses, but the overall cumulative impacts are expected to be the same - high economic losses to the commercial fishing industry.

f. Impact on Sportfishing

i. Discussion: Sportfishing activity likely to interact with the impacting factors associated with proposed Sale 73 will occur seaward of the coastline from Estero Bay to Point Conception (Figure III.C.7-1). Along this 80 miles of coastline the major sportfishing concentrations associated with the beaches, piers and boating access sites around Morro Bay and Port San Luis. Additionally, some beach and pier fishing is associated with the Pismo Beach and Gaviota areas. Offshore boat fishing can occur throughout the state territorial waters and the nearshore tracts associated with proposed Sale 73. Oil spills, offshore structures, vessel traffic, marine terminals and pipelines associated with the exploration, production and transmission of products from the 360 offshore lease tracts under consideration in proposed Sale 73 and the servicing of offshore operations within those tracts can possibly affect sportfishing (see Appendix A for definition of impact levels).

Oil Spills. Offshore oil and gas activities sometimes result in accidental release of oil. Large oil spills can be a significant impact-producing agent on sportfishing. An oil spill is likely to deter sportfishermen from going to any beach, pier or offshore area that is contaminated due to the possibility of the oil fouling boats and fishing gear and the fear that fish caught in polluted water may be contaminated or bad tasting. Oil spills have the additional potential of causing a temporary reduction in populations of target species which may leave the area affected by an oil spill. Adverse publicity of an oil spill will keep sportfishermen away from the affected area and cleanup and containment operations can effectively block access to the fishery.

Onshore Support Facilities. Should harbor and docking facilities be used to capacity, oil and gas leasing could lead to competition for limited space. Commercial passenger fishing vessels (partyboats) and skiff rental operations could conceivably be affected from this competition.

Vessel Traffic. Increased vessel traffic in the form of work boats, crew boats, and tankers would increase the possibility of collisions with sportfishing boats and can cause disturbance to sportfishing in the form of wakes and noise.

Pipelines. Pipeline installations can cause a temporary reduction in sportfishing access. The installation of a pipeline through the surf zone and across the beach will necessitate the closure of up to 400 meters of beach for up to 2 weeks. In order to minimize the impact to sportfishing, the installation of the pipeline should be conducted during the non-peak use season for the particular stretch of beach involved. However, once installation is completed, pipelines will have no effect on sportfishing in the area unless a break or rupture occurs in the line. If it is in a gas pipeline, then the impact would be the closure of part of the beach while the repairs are completed. If an oil pipeline ruptures, then the impact would also occur from the oil contamination of the sediment. The probability of a break or rupture occurring at the landfall is extremely remote and need not be addressed.

Sportfisheries are often enhanced by pipelines due to the artificial reef effect. These structures provide a suitable substrate for food and cover in areas that otherwise are largely devoid of these essentials. The actual value of the increased sportfishery potential in the vicinity of an offshore structure in California is limited.

Offshore Structures. Offshore structures would remove a small area from the sportfishing grounds which would have a very low impact (economic loss insignificant, a few fishermen affected by minor inconveniences, if any) to the sportfishing industry. Sportfisheries are often enhanced by offshore structures due to the artifical reef effect. These structures provide a suitable substrate for food and cover in areas that otherwise are largely devoid of these essentials. The actual value of the increased sportfishery potential in the vicinity of an offshore structure in California is limited, primarily because tying up to the structure is prohibited, and anchoring or drifting next to a platform is discouraged.

"The Ecology of Petroleum Platforms in the Northwest Gulf of Mexico: A Community Profile" (Gallaway, 1982), although focused on studies in the Gulf of Mexico, provides an excellent summary and synthesis on how offshore structures affect fish and ultimately fishing. This report was published by BLM as Open File Report No. 82-03 and is distributed through the U.S. Fish and Wildlife Service and the Gulf of Mexico Region of the Minerals Management Service.

PROPOSED SALE AREA

Oil Spills. Based on the Oil Spill Risk Analysis Model (Section IV.A.4.a), one large spill is expected to result from proposed Sale 73 and impact the offshore waters of the southern portion of the Santa Maria Basin. A portion of the Channel Islands National Marine Sanctuary is likely to be hit by this projected spill; however, the Pacific coastal shorefront is not expected to be acutely affected by major spills resulting from the proposal. Offshore, sportfishing in the Santa Maria Basin is likely to decline 10 to 30 days in the vicinity of the spill source; however, a low impact is expected with the locally associated sportfishing community unless excess publicity discourages offshore fishing for an extended period of time. Some individual partyboat captains unable to shift their operations outside the immediate vicinity of a spill could suffer a more serious impact. Should this occur, relief would be available through the Oil Pollution Compensation Fund (Section IV.B.9).

Onshore Support Facilities. During the initial exploration phases, some sportfishing boats may lose out in competition for berthing spaces with crew boats in the Port San Luis area. Supply boats would operate out of Gaviota, where there are existing commercial facilities.

Vessel Traffic. Vessel traffic increases will impact sportfishing due to the increased number of crew boats, work boats, and tankers which are anticipated to be introduced to the area. The number of additional vessels and the number of trips for each of the vessels is given in Section IV.E.3.m. The impact to sportfishing from vessel traffic is anticipated to be very low in the southern portion of the Santa Maria Basin.

Pipelines. Two pipelines are expected as a result of the proposal. They would come onshore near Nipomo Mesa and Point Conception. These would have a very low impact on sportfishing as the removal of the right of way from fishing would be of short duration.

Offshore Structures. The impact from the anticipated five platforms resulting from this proposal is expected to be very low. The area removed from the sportfishing grounds would be very small; however, an increase in fish density is expected around the platforms. Although fishing in the imediate vicinity of the platforms is discouraged, fishing in areas adjacent to platforms should improve and offset the loss of area.

The expected impact to sportfishing from the development of the proposed sale area is expected to be low at the local level, and very low for the salewide area.

AREAS OUTSIDE THE SALE AREA

Except for some increase in vessel traffic in the Santa Barbara Channel area, which is unlikely to have an appreciable effect on sportfishing, no additional oil spills, pipelines, onshore facilities or offshore structures are expected to result from proposed Sale 73 outside the proposed sale area that would impact sportfishing.

ii. Conclusions: As a result of the proposal, the impact to sportfishing is expected to be low (a temporary economic loss to a few partyboat captains). Most recreational fishing activity is expected to continue throughout the Santa Maria Basin even in the event of an oil spill.

iii. Cumulative Impacts: Major projects in the immediate vicinity of proposed Sale 73 likely to be a contributing factor to pressures on sportfishing include: state tidelands oil and gas leasing from Point Conception to Point Arguello; expansion of Vandenberg Air Force Base; a proposed LNG facility near Point Conception; and San Pedro Bay Coal Terminals and the expansion of Port Hueneme (Section IV.D.1-5). Besides stimulating the industrial base of San Luis Obispo and Santa Barbara counties, these projects will stimulate acceleration of population increases which are likely to bring more sportfishing demand to the area potentially affected by proposed Sale 73. Increased vessel traffic is also likely; however, it is unlikely to be at a level sufficient to discourage sportfishing from boats. Berthing, port, wharf and marina space should expand along with these industrial developments. There would be additional threats of large oil spills, especially those more likely to impact shorebased fishing locations and marina sites. Some temporary disruptions and displacement of fishing activity is likely to occur from oil spill impacts; however, the long-term growth of the marine sportfishing industry is unlikely to be affected within Central California because of the incremental pollutants and activities associated with proposed Sale 73. The synergistic effect of additional chronic pollutants from expanded marine related industries and additional competition for the select target species from an expanded sportfishing population is likely to have an adverse effect on catch rates over time. Additional oil and gas structures (up to

TABLE IV.E.3.g-1

SHOREFRONT PARKS, BEACHES AND RECREATION AREAS

San Luis Obispo County	Santa Barbara County
W. R. Hearst Memorial State Beach	Point Sal State Beach
San Simeon State Beach	Ocean Beach County Park
Cambria County Beach	Jalama Beach County Park
Cayucos State Beach	Gaviota State Park
Morro Strand State Beach	Refugio State Beach
Atascadero State Beach	El Capitan State Beach
Morro Rock Park	Isla Vista Beach Park
Morro Bay State Park	Goleta Beach County Park
Montana De Oro State Park	Arroyo Burro Beach County Park
South Bay Community Park	Shoreline Park
Avila State Beach	Leadbetter Beach and Park
Pismo State Beach	Santa Barbara Beach (West & East Beach)
Oceano Memorial County Park	Lookout Beach County Park
Pismo State Vehicle Recreation Area	Carpinteria City Beach
	Carpinteria State Beach

Channel Islands National Park

50 total), especially those nearest shore, are likely to have a positive effect on long-term catch rates of select target sportfish in the Santa Maria Basin. Assuming expanded and improved marine fishery management stemming from Fisheries Conservation and Management Act (1976) and greater concern and success for marine pollution control and abatement, further OCS oil and gas leasing should have a low impact on marine recreational fishing in the Central California area.

g. Impact on Recreation

i. Discussion: Chapter III provides a general discussion of recreational resources and activities likely to be affected by OCS leasing and development off the Central California Pacific Coast. Proposed Sale 73 consists of 360 tracts directly offshore of an 80 mile coastline stretching between Estero Bay and Point Conception. The major recreational resources and associated water-dependent and water-enhanced recreational activities potentially jeopardized by the proposal are primarily associated with the designated Pacific shorefront park, recreation, and beach areas along this 80 mile stretch (Table IV.E.3.g-1). Figure III.C.7-1 shows that approximately 25-30% of the linear shorefront is dedicated public recreation land directly facing the proposed action. The Morro Bay and Port San Luis/ Pismo Beach areas are the most heavily utilized recreational shorefronts closest to the proposed lease tracts. Associated with the parks and beaches is water dependent recreational activity such as boating, fishing (see sportfishing), surfing, swimming, and diving, and water-enhanced recreational activities such as beach use, sightseeing, golfing, picnicking, camping and off-road vehicle use. Impacts on these recreational resources and activities could result from oil spills, pipelines, onshore facilities, offshore structures, vessel traffic, noise and air quality (see Appendix A for a listing of the levels of impact to recreation and their definition).

Oil Spills. Offshore oil and gas activity sometimes results in an accidental release of oil. Major oil spills are the most feared impacting agents to recreation, as they tend to temporarily preclude all recreation in the areas of contact. While still at sea, oil spills in this region would adversely affect all waterborne recreational activities, including sailing, cruising, racing, swimming, diving, surfing, and fishing. Where oil spills contact the coast, they could restrict to port all boats which are in the harbor, due to the installation of booms. Most noticeably the impact to recreation will be seen where oil spills contact the shoreline. This will adversely affect seashore related recreational activities such as beach use, camping, nature appreciation, picnicking, and using off-road vehicles. If only tar balls were present, most general beach use would still be possible. The loss of beach usage and boating opportunities due to an oil spill could range from a very low (no closure of water-oriented recreational facilities, all beach and water use occurring with minor inconvenience, if any) to a very high (complete closure of all water-oriented recreation facilities for any length of time, or partial closure for an extended period of time, or a 25 percent or greater economic loss to the industry) impact to the local economy.

Very high impacts to selected shorefront recreation supported businesses were seen in Santa Barbara after the Santa Barbara spill (Mead and Sorensen, 1970), in Brittany after the AMOCO CADIZ spill (1,600,000 barrels) (NOAA/EPA, 1978), and at Padre Island, Texas after the IXTOC I spill (3,100,000 barrels (Restrepo and Associates, 1982). The economic damages from these catastrophic spills suffered by the recreational industry were not equally distributed throughout the region of impact, but were confined to a small number of beach and non-beach related businesses located close to the water's edge. None of the obvious impacts extended past one year and most impacted areas regained pre-spill recreational and economic activity within a month or two of abatement, containment and cleanup. Other factors associated with major oil spills, such as seasonality and media coverage, were shown to influence the severity of impacts on recreation and tourism. Although duplication of the Santa Barbara, IXTOC or AMOCO CADIZ incidences are considered extremely remote in light of current technology and preventative mechanisms in place (Section IV.B.1-9), such incidences have occurred and may be conceivable from additional OCS leasing along the California Coast.

In the event that a spill does occur, containment will be initiated as swiftly as possible, and when combined with the preparations of the local oil spill contingency plans, the impact to the shoreline could be lessened considerably. However, there could still be a closure of the beach for a period of time.

The time involved for cleanup operations depends entirely upon the size and duration of the spill, the extent and type of shoreline impacted, the effectiveness of the cleanup equipment, the accessibility of the impacted area, the speed of the response team, and the weather.

Beach fouling and surface slicks could result from chronic spillage. This would be relatively minor compared to the major accidents, but could be a continual nuisance to the recreationists. The magnitude of these impacts would be comparable to those from the natural seeps.

Pipelines. Pipeline installations can cause a temporary reduction in sportfishing access. The installation of a pipeline through the surf zone and across the beach will necessitate the closure of up to 400 meters of beach for up to 2 weeks. In order to minimize the impact to sportfishing, the installation of the pipeline should be conducted during the non-peak use season for the particular stretch of beach involved. However, once installation is completed, pipelines will have no effect on sportfishing in the area unless a break or rupture occurs in the line. If it is in a gas pipeline, then the impact would be the closure of part of the beach while the repairs are completed. If an oil pipeline ruptures, then the impact would also occur from the oil contamination of the sediment. The probability of a break or rupture occurring at the landfall is extremely remote and need not be addressed.

Onshore Facilities. Onshore facilities would impact any recreational facilities in the immediate vicinity, due to the oil and gas facilities causing a decrease in the pristineness of the area, thus detracting from the recreational enjoyment. There is no expected impact to beach use from the placement of the onshore facilities other than those described for visual resources (Section IV.E.3.i).

Offshore Structures. Offshore structures have both beneficial and adverse effects on recreation. A single offshore structure or a concentration of offshore structures could inhibit visual quality, sailing, and boat racing, and may be a minor hazard to navigation in adverse weather. However, the structures also serve as good navigation markers and locations where emergency help can be obtained. There is no expected impact to beach use from the placement of the offshore structure other than those described for visual resources (Section IV.E.3.i).

Vessel Traffic. Vessel traffic would have a very low impact on recreational boating due to the increase in vessels in the area with the introduction of work boats, crew boats, barges and tankers. Vessels would also impact recreational boating by competing for existing berths at the local harbors.

Noise. Noise will be noticeable during all stages, but mainly during development and abandonment when construction and teardown occurs. Lower levels of noise would be found during the entire life of the sale from such sources as helicopters flying to and from the offshore platforms, and the increased number of boats operating in the area (see also Section IV.A.7).

Air Quality. Air quality changes would have an impact on recreation areas if pollution levels increase along with the corresponding aromatic effluents. These aromas, if they occur, would have a discouraging effect on the recreationist's desire to visit an area (for complete discussion of air quality, see Section IV.E.1.c).

PROPOSED SALE AREA

Oil Spills. One large oil spill is expected to occur in the proposed sale area as a result of this proposal; however, it is not likely to come ashore along the Pacific coast mainland.

If a spill does occur and contact the coastline, a closure of the affected beaches would occur for the duration of the spill. The length of time an oil spill would be retained on the beach would depend upon the size of the spill and the oil retention of the particular stretch of coastline. In the proposed sale area, the oil retention varies from several days at Point Arguello to over a year at Morro Bay (Woodward and Clyde, 1982).

Closure of the beaches would have a major effect on the region due to the number of recreationists, approximately 11.6 million in 1980, who utilize the beach. The summer months are the period of highest use with approximately 40 percent of the beach use occurring between July and September (The

Granville Corporation, 1981). This puts a heavy dependence by the local "Mom and Pop" businesses on the recreationists, as a large part of their revenue is obtained during the short recreation season. Any shift of the recreationist from the normal use area would create an economic burden to the local communities. Relocation of these recreationists to other beaches in the region would not be possible in all cases due to travel cost and distance, beach capacity, additional time required to get to another facility and availability of a suitable facility. This would reduce the value of recreation to the local economy by an unknown amount.

The value of the coastal recreation in the proposed sale area is in excess of $99 million (The Granville Corporation, 1981). When this value is incorporated into the local economy, the total value of recreation will be increased by the output multiplier (2.35 based on The Granville Corporation, 1981) and will add over $233 million to the economy of the local region. If a spill occurred during the peak use season, and closed down the recreational areas on the coast for 30 days, up to 15 percent of the annual value of the recreation in the affected area would be lost.

If the expected spill contacts the Point San Luis area (7% probability), the impact to recreation with a 30 day closure would mean a reduction of approximately 350,000 recreationists with a corresponding loss of over $3 million in recreational value. This could remove as much as $7.3 million from the local economy.

If an oil spill contacted Point Arguello, the impact to recreation would be minimal, since the Point Arguello region is closed to public recreation due to Vandenberg AFB. The only area in the Point Arguello area open to the public is Jalama Beach Park and Surf.

The potential for a large oil spill affecting the recreational resources of the San Luis Obispo and Santa Barbara coastline and associated recreational activity is actually very slight from proposed Sale 73. There is a 7% probability or less that a major spill from the proposal (one spill expected) will contact the two county shorefronts (Land Segments 24-27, Appendix F, Table IX.F-2) of which 30% is dedicated recreation land within 30 days of the spill. The probability of contact to the offshore islands in Channel Island National Park will increase up to 14% on one island (San Miguel), but is still not expected from the proposal.

Pipelines. The installation of the anticipated pipelines will impact beach use at and near the landfalls during the contruction phase. This will require the closure of part of the beach where the pipelines come ashore near Nipomo Mesa and Point Conception for a period of one or two weeks. This will have a very low impact on general recreation, and full utilization of the area should be restored once installation is complete.

Onshore Facilities. Onshore facilities are anticipated to have a low impact (no closure of water-oriented recreational facilities, most beach and water use still possible, or less than a 5% loss to the industry) on recreation as they are assumed existing, or to be constructed with similar facilities.

Offshore Structures. A low to very low impact on recreation is anticipated in the proposed sale area from the five platforms expected from this proposal. This impact would be in the form of removing a small area from the use of recreational boaters and sportfishermen. The visual degradation to the recreationists is based on the visual resources of the area and is given in Section IV.E.3.i.

Vessel Traffic. Increased vessel traffic will impact recreational boating due to the number of crew boats, work boats, and tankers which are anticipated to be introduced to the area. The number of additional vessels and the number of trips for each of the vessels is given in Section IV.E.3.m. The impact to recreation from vessel traffic is anticipated to be very low in the proposed sale area.

Noise. The impact of noise on recreation is anticipated to be very low for most of the life of the field. However, a moderate impact can be expected locally during periods of construction.

Air Quality. Air quality would not be expected to change significantly with no impact to recreation.

AREAS OUTSIDE THE PROPOSED SALE AREA

Other than the increased vessel traffic from tankering 50% of the expected production to the north and south of the sale area and ferrying crew and work boats during exploration phases from established staging areas and marine terminals in the Santa Barbara Channel area, no additional impacting factors (oil spills, structures, pipelines, etc.) associated with the proposed action are likely to affect recreation resources or activities outside the sale area. The increased vessel traffic outside the sale area from Sale 73 will effect recreational activities (water dependent) minimally, if at all.

ii. Conclusions: The proposed action is expected to have a low to very low impact on the recreational use and enjoyment of the beaches, parks and nearshore waters of the Central California Coast. The aesthetic quality of some water dependent and water enhanced recreational activities between Morro Bay and the Santa Barbara Channel may be minimally affected from the 3 to 5 oil and gas structures introduced into the offshore viewshed for 20 to 40 years, and intermittent minor conflicts with boat wakes, increased noise levels and residual pollutants associated with major or minor accidents are likely to occur. The overall level of recreational use and associated economic activity in Santa Barbara or San Luis Obispo counties should be unaffected by Sale 73 as proposed.

iii. Cumulative Impacts: Major projects in the vicinity of proposed Sale 73 likely to affect the quality of the marine recreational environment over time include: state tidelands oil and gas leasing from Point Conception to Point Arguello; the expansion of Vandenberg Air Force Base and Port Hueneme; a proposed LNG facility near Point Conception; and the San Pedro Bay Coal Terminal Projects (Section IV.D.1-5). Should some or all of these projects be implemented together with expanded OCS development and continued import tankering, it will stimulate economic development and accelerate population increases in San Luis Obispo and Santa Barbara counties. Greater resident demand for the natural and developed recreational resources and support services of the two county areas are likely to occur. The general character or ambience of the recreational environment is likely to slowly decline (beaches more crowded, more boats, more cars, additional pollution, seascapes encumbered with more structures, etc.), yet the growth of the recreational industry is expected to continue. Although the threat of major oil spills likely to acutely impact the recreational shorefronts of Central California will definitely increase (at least six large spills expected over the next 40 years), and likely cause temporary disruptions of recreational activities with some adverse economic consequences, both within and outside the sale area (Appendix F, Table IX.F-2), Sale 73 in and of itself is unlikely to make an appreciable difference on these expected recreational consequences. Overall moderate impacts are expected from these activities.

h. Impact on Tourism

i. Discussion: Tourism is one of the largest industries in California, directly affecting more than one million jobs. Tourism is the non-routine travel to an area (California Office of Tourism, 1971b).

Within the proposed sale area, or the area most directly associated with the 360 lease tracts (Point Conception to Morro Bay), tourism is the sustaining economic activity of several communities. Over 20,000 residents in the communities around Morro Bay (Morro Bay City, Baywood Park, Los Osos and Cayucos) and another 18,000 residents around San Luis Bay (Pismo Beach City, Grover City and Oceano) rely heavily on the recreational and scenic resources (Table IV.E.g-1 and Figure III.C.7-1) of the Pacific shoreline that attract visitors year round with peak use during the summer months. In Santa Barbara County very little tourist activity is currently associated with the Pacific shorefront between Point Sal and Point Conception. The cities of Santa Barbara and Carpinteria, although somewhat removed from the Sale 73 proposal, have a thriving tourist industry focused on their coastal shorefronts. Oil spills, offshore structures, onshore facilities, pipelines, noise and air pollution are factors sometimes associated with OCS leasing and development that could ultimately affect the tourist industry (see Appendix A for a complete list of the levels of impact to tourism and their definition).

Oil Spills. Offshore oil and gas activities sometimes result in an accidental release of oil. Large oil spills can be a major impacting agent on tourism, as a spill could close sections of the coast to recreational use and have a degrading effect on the visual quality wherever contact with the coastline occurs.

Central California has numerous tourist areas which are sensitive to impact from oil spills. The impact to the local economies can be approximated by estimating the number of tourists who would stay away from the area. This percentage would be greater for the small communities than for the large cities. For example, in San Francisco, the majority of tourists spend part of their time sightseeing and/or attending cultural functions, as opposed to the small communities along the coast where tourists tend to spend their time relaxing at the beach, fishing or enjoying the local coastal environment.

Thus, the small community whose economic base is heavily dependent on beach-oriented tourism could be more severely impacted than the larger communities. The larger city, however, would probably have a lower percentage of reduction in tourism, as there are numerous other activities which people would substitute. Business along the beach at the larger city would be more seriously impacted economically than their counterparts in the central business district of the city, but would tend to be more able to survive than their small community counterparts.

Grave impacts to selected shorefront tourist supported businesses were seen in Santa Barbara after the Santa Barbara spill (Mead and Sorenson, 1970), in Brittany after the AMOCO CADIZ spill (1,600,000 barrels) (AMOCO CADIZ Oil Spill, 1978), and at Padre Island, Texas, after the IXTOC I spill (3,100,000 barrels) (Restrepo and Associates, 1982). The economic damages from these very large spills suffered by the tourist industry were not equally distributed throughout the region of impact but were confined to a small number of beach and non-beach related businesses located close to the water's edge. None of the obvious economic impacts extended past one year, and the most imacted areas regained pre-spill recreational and economic activity within a month or two of abatement, containment and cleanup. Other factors associated with major oil spills, such as seasonality and media coverage, were shown to influence the gravity of impact on the tourist industry. Although the duplication of the Santa Barbara, IXTOC or AMOCO CADIZ incidences are considered extremely remote in light of current technology and preventative mechanisms in place (Section IV.B.1-9), such incidences have occurred and may be conceivable from additional OCS leasing along the California Coast.

The time involved for cleanup operations depends entirely upon the size of the spill, the oil persistence and the type of shoreline contacted (Woodward and Clyde, 1982), the extent of shoreline contacted, the effectiveness of the cleanup equipment, the accessibility of the impacted area, the speed of the response team, and the weather.

Beach fouling and surface slicks could result from chronic spillage. This would be relatively minor compared to the major accidents, but could be a continual nuisance to the tourist. The magnitude of these impacts would be comparable to those from the natural seeps. The overall impact on the tourism would be very low (no shutdown of tourist facilities, no drop in tourism, minor inconveniences, if any) and would tend to reduce beach use at a particular site on a day-to-day basis, as seen when the tar from the natural seeps impacts the beaches in the Southern California area.

Offshore Platforms. Offshore platforms can cause a degradation to the visual quality of the proposed sale area as is stated in Section IV.E.3.i. This degradation may tend to have a slight discouraging effect on some people's desire to visit the area.

Onshore Facilities. Onshore facilities can also cause a degradation in visual quality of the proposed sale area as is stated in Section IV.E.3.i. This degradation could tend to discourage people from visiting the locations where the onshore facilities are sited.

Pipelines. Pipeline landfalls can have a very minor and localized temporary impact on tourism based on the construction activity at the landfall site during the installation process. This disruption would be very localized and the area should regain its pre-installation characteristics within a short time (see Section IV.E.3.g and i).

Noise. Noise will be noticeable during all stages of the field life, but mainly during development and abandonment when construction and teardown are taking place. Lower levels of noise will be found during the entire life of the sale from such sources as helicopter flying to and from the offshore platforms, and the increased number of boats operating in the area (see also Section IV.A.7). This noise could impact tourism by reducing the naturalness of the area by introducing more man-made sounds into the area.

Air Quality. Air quality changes would have an impact on tourism if pollution levels increase along with the corresponding aromatic effluents. These aromas, if they occur, could have a discouraging effect on the tourist's desire to visit or to remain in an area (for complete discussion of air quality, see Section IV.E.1.c).

PROPOSED SALE AREA

Oil Spills. Based on the Oil Spill Risk Analysis Model (Section IV.A.4.a), one large spill is expected to result from proposed Sale 73 and impact the offshore waters of the southern portion of the Santa Maria Basin. The potential for this spill to directly impact the recreational and tourist-related activities of the San Luis Obispo and Santa Barbara coastline is actually very slight. There is a 7% probability or less that the two county mainland shorefront will be contacted within 30 days of expected oil spills from the proposal (Appendix F, Table IX.F-2, Land Segments 24-27). Barring extensive publicity and undue anxiety within the major tourist market areas for San Luis Obispo and Santa Barbara Counties, the tourist industry within the two county area should be unaffected by major oil spills from proposed Sale 73.

Offshore Structures. A very low impact on tourism is anticipated from the five platforms expected from this proposal if the platforms are separated. An increase in impact level up to low (no shutdown of tourist facilities, most tourism still occurs) would be expected if the platforms are grouped. The visual degradation to the tourist is based on the visual resources of the area and is given in Section IV.E.3.i.

Onshore Facilities. Onshore facilities are expected to have a very low impact, if any, to tourism in the area. The onshore facilities are expected to be already existing or to be placed with similar facilities.

Pipelines. The predicted landfalls (Point Conception and Nipomo Mesa) for the proposal will not have a major impact on tourism. However, the installation of the pipeline would necessitate the closure of up to 400 meters of beach for up to two weeks. Since the beach at Point Conception is inaccessible due to the security at Vandenberg Air Force Base, the expected impact would be very low. Although the beach at Nipomo Mesa is more accessible, the expected impacts from construction would also be very low.

Noise. Noise is anticipated to have a very low impact on tourism for the life of the field. However, a low impact can be expected locally during periods of construction.

Air Quality. Air quality is expected to not change significantly with no impact to tourism over most of the area. A very low impact is expected due to reduction in air quality which might occur at the processing plant from the hydrocarbon production from the proposal.

AREA OUTSIDE THE PROPOSED SALE AREA

Oil Spills. If a spill does occur and contact the coastline, a reduction in tourism could occur for at least the duration of the spill. The length of time a spill would be retained on the beach would depend upon the size of the spill and the oil retention of the particular stretch of coastline. In Central California the oil retention varies from several days at Pigeon Point to over a year in Elkhorn Slough (Woodward and Clyde, 1982).

Tourism in Central California is centered at Point Reyes, San Francisco, Santa Cruz, Monterey and Carmel, and is dependent upon the tourist attractions present at each of these centers and upon the scenic quality of the area (see Section IV.E.3.i). As an example, the scenic quality of the Big Sur Coast is not the only attraction of the coastline, but also the man-made attractions such as Hearst San Simeon.

If an oil spill occurs and contacts the coastline for 30 days during the peak tourist season, it could cause a reduction in tourism large enough to cause a loss in tourist revenue of over $205 million (California Office of Tourism, 1981a; The Granville Corporation, 1981). When this value is incorporated into the local economy the total loss to the tourism in the area will be increased by the output multiplier (2.46 based on The Granville Corporation, 1981) and could result in a loss of over $517 million to the regional economy. This would be a very high impact to the communities involved and to the area's economy.

Outside the proposed sale area there is less than a 2% probability that the Pacific mainland shorefront will be contacted by the one major oil spill expected from the proposal. Therefore, Sale 73 is very unlikely to affect tourism outside the proposed sale area as a result of oil spills.

Offshore structures, onshore support facilities, pipelines, noise and air pollution resulting from the proposal will not occur outside the proposed sale area, therefore will have no impact on tourism outside the proposed sale area.

ii. Conclusions: Lease Sale 73 is unlikely to have a significant impact on the tourist industry within or outside the proposed sale area. Minor pollution incidences (visual, water, air) offshore and onshore within the proposed sale area will detract from the aesthetic quality of the environment in selected areas but is unlikely to have local or regional effects on the tourist industry. Overall, Lease Sale 73 is expected to have a very low impact on tourism.

iii. Cumulative Impacts: Major projects in the vicinity of the proposed action likely to effect the quality of the environment threatened by Sale 73 include: state tidelands oil and gas leasing from Point Conception to Point Arguello; the expansion of Vandenberg Air Force Base; and proposed LNG facility near Point Conception; (Section IV.D.1-5). Should some or all of these projects be implemented together with expanded OCS development and continued import tankering, it will stimulate further economic and industrial development. Synergistically all these projects will increase the chronic pollutants (visual, water, air) detracting from the natural and aesthetic qualities of the environment associated with the Pacific Coast shoreline of San Luis Obispo and Santa Barbara Counties. The likelihood of additional offshore structures affecting the seaward viewscapes will increase (6 nearshore, up to 10 offshore, Table IV.D.4-1) and at least 6 major oil spills are likely to occur over the next 40 years (Table IV.A.4-2) contacting several major areas which attract tourists between San Francisco and Santa Barbara (Appendix F, Table IX.F-2). Although there will be temporary minor and major disruptions of tourist activity in specific destination locations along the Central California Pacific coastline, the tourism industry should continue to grow and prosper in spite of this expected industrial development and associated accidents. Although the impacts to tourism could be moderate to high in a localized community acutely impacted by a very large oil spill, Sale 73 should add only a small risk to that eventuality.

i. Impact on Visual Resources

i. Discussions: Visual Resources: The California coastline was described in the California Coastal Plan (California Coastal Zone Conservation Commmission, 1975) as "an outstanding visual resource of great variety, grandeur, contrast, and beauty that can be enjoyed by all the people of the State." In addition, the plan noted that the visual resources "add to the quality of life for coastal residents, visitors, and workers, and contributes to the economic success of the tourist industry by attracting many vacationers to the coastline." Impacts to the visual resources can occur from almost any source and vary in scope from small sources such as a Coastal Access Sign, to large sources such as major construction projects.

Oil and gas development has the potential to impact visual resources from various sources. The main impacting agents to visual resources are offshore structures, oil spills, onshore facilities and pipelines (see Appendix A for a complete list of levels of impact to visual resources and their definitions).

Offshore Structures. Offshore structures can cause the longest lasting, most prominent visual impact to ocean views. Oil and gas platforms are fairly prominent objects, exhibiting discordant vertical and angular lines against the soft horizontal plane of the sea. The curvature of the earth will hide an offshore structure more than 20 miles out from an individual standing at the water's edge (sea level). In reality, however, structures over 15 miles from shore are rarely visible at any elevation and those structures past 10 miles from shore may be noticeable 40% to 60% of the time from shore but are unlikely to be distinguishable from passing ships unless viewed through binoculars. Structures located three to five miles from shore are evident seascape features perceptible and recognizable from shore on any fair weathered day or those days people are most likely to seek recreation and enjoyment from the seashore. Structure groupings are more disruptive offshore landscape elements than individual structures.

Because of lighting, structures are visible at night for a distance equal to or exceeding daytime ranges. Although many people have expressed viewing offshore platforms at night as pleasant experiences, the relative value of individual perceptions are often based in personal value systems.

Oil Spills. Offshore oil and gas activities sometimes result in an accidental release of oil. Oil spills will impact visual resources of the area if they occur. The impacts would be noticeable mainly at the points of contact with the shoreline. The degree of impact would depend upon the size of the spill, the type of shoreline that is contacted, the weather conditions at the time of contact, the aesthetic quality of that stretch of shoreline, and most important, the likelihood of people being in a position to view the impacted land and water interface.

Without cleanup, a flat, sandy coastline would tend to retain oil longer than a rocky or cobble coast, but not as long as an estuary or a lagoon. The oil retention for the Central California Coast has been determined by Woodward and Clyde (1982) and can range from several days to over a year. Weather conditins may influence the impact of an oil spill since deposited oil will generally be removed by wave actions reworking beach materials. In general the greater the wave action the faster the oil will be removed from the beach.

Beach fouling and surface slicks could result from chronic spillage. This would be relatively minor compared to the major accidents, but could be a continual degradation to the visual resources. The magnitude of these impacts would be comparable to those from the natural seeps. The overall impact on the visual resources would be very low (no significant reduction in visual quality, few people notice changes, no reduction in recreational use or property values), and would tend to degrade the aesthetic appeal of a particular site on a day-to-day basis, as is seen when the tar from the natural seeps impacts the beaches in the Southern California area.

Onshore Support Facilities. Onshore support facilities can have an adverse impact on visual resources, the degree depending upon the nature and number of the facilities and their location. Visual resource degradation could decrease recreational enjoyment of the beaches and coastal waters for some people. Onshore visual impacts during exploration could entail land use changes for equipment storage, heliports, communication and navigation equipment facilities, increased vehicular traffic, and construction activities. During the development stage, onshore storage and processing facilities, pipeline installation, and pipeline and barge fabrication and equipment storage yards will all involve some deterioration of the visual resource onshore.

Pipelines. Pipelines would impact visual resources during their installation by the presence of barges operating offshore and by the trenching for the pipeline onshore. This would only last during the installation period; however, the earth scar onshore would remain visible for a length of time dependent on the soil type and the native vegetation. This could last for several years in the case of a wooded area, or could be removed by the first winter storm in the case of a sandy beach.

The magnitude of the impact on the aesthetic quality of the shoreline will depend upon the existing aesthetic quality of the stretch of coast and the impacting agent. An oil spill on the more scenic streches of coast will tend to have a greater impact than on other parts of the coast. However, any stretch of coast that is contacted by oil will have a very high impact (visual quality degraded to an extent that it affects all people in the area and will temporarily reduce recreational visitation to the area).

PROPOSED SALE AREA

Under contract with BLM, the Granville Corporation (1981) developed an aesthetic resource classification system specific to the California Coast. They divided the California Coast into 39 segments and inventoried and divided scenic resources within each landscape unit into four categories for rating: landforms, vegetation, the water's edge and offshore features, and cultural modifications. Scenic resources were then numerically judged on distinctiveness, variety and harmony, as well as ephemeral features such as sounds and smells. Based on their evaluations, the eight landscape units between Estero Bay and Point Conception received overall aesthetic ratings from medium to high (Granville Corporation, 1981, Volume III, pp 169-183), indicating a scenic to very scenic shorefront for the offshore coastal area most directly associated with proposed Sale 73. The rating presents a standard upon which to assess impacts from offshore and onshore features expected to result from the proposed action.

Offshore Structures. Five platforms are anticipated to be placed in the southern portion of the Santa Maria Basin as a result of this proposal. The impact from these platforms depends upon whether they are within five miles of shore, separated or grouped, and within which landscape unit they might be located.

The Granville Corporation evaluated the relative degradation of their established aesthetic values for each landscape unit between Estero Bay and Point Conception (Granville Corporation, 1981, Volume I, pp 10-11) based on the introduction of offshore structures within the initial tier of offshore lease tracts (3-6 miles from shore) of each unit. They determined the introduction of a single structure in any unit would cause a numerical degradation from 0 to 10 points. Each appraised landscape unit value, that is, high or medium high, represented a numerical range of 15 to 16 points. Therefore, the single OCS structure in the first tier of OCS tracts is unlikely to significantly degrade seashore aesthetics. These same landscape units associated with the proposed Sale 73 lease area were reevaluated considering the installation of a grouping of four closely associated structures within the first tier of OCS lease tracts (3-6 miles from shore).

Under this scenario they determined the numerical degradation to range from 5 to 20 points. As 15 to 20 points is equal to or exceeds the numerical range of a rating value category, that is, high or medium high, such an impact should be considered significant. The four existing platforms of the Dos Cuadros unit (The Granville Corporation, Unit 30) off Santa Barbara is an example of a significant degradation of offshore aesthetics resulting from OCS structures. Structures placed beyond the second tier of OCS tracts (over 9 miles from shore) are unlikely to have a measureable effect on offshore aesthetics.

Oil Spills. One large oil spill is expected to occur in the proposed sale area as a result of the proposal. If a spill does occur and contact the shoreline, a degradation in visual quality will occur and will remain until cleanup is accomplished either by man or natural processes. The spill which contacts the shoreline will temporarily have a very high impact on the visual resources of the area. Actually there is a very small risk that any Pacific coastal mainland shoreline between Morro Bay and Point Conception will be acutely impacted by a major oil spill from proposed Sale 73. The San Luis Obispo shoreline in the vicinity of Morro Bay is most vulnerable to be impacted from the one large spill expected; however, the probability of impact has been assessed at only 7% (Appendix F, Table IX.F-2).

Onshore Facilities. Existing onshore support, terminals, processing and staging facilities within the proposed sale area are expected to be utilized to accommodate operations and production resulting from proposed Sale 73. Some expansion of existing facilities are likely if significant finds occur. Resulting visual degradation is unlikely to be significant as the disruptive character of the onshore facilities has already been established.

Pipelines. Two pipelines are anticipated from development of the proposed sale area. The pipelines will come ashore at Nipomo Mesa and Point Conception. These pipelines are anticipated to have a very low visual impact at the landfall, and a low impact along the onshore right-of-way.

AREAS OUTSIDE THE PROPOSED SALE AREA

Offshore structures, onshore facilities, pipelines, and oil spills associated with proposed Sale 73 are not expected to impact the visual quality of landscapes and seascapes outside the proposed sale area.

ii. Conclusions: The expected development from proposed Sale 73 is anticipated to have a low impact (minor degradation in visual quality offshore, most people accept the change, no reduction in recreation use or property values) to visual resources over the proposed sale area and none outside the proposed sale area. Offshore structures placed within three to five miles of shore will cause the most perceptible and lasting landscape changes, but these changes are unlikely to affect the local recreational habits or tourist levels in the impacted areas.

iii. Cumulative Impacts: Impacts to visual resources occur both offshore and onshore from other projects and existing leases.

Other major projects likely to cause landscape changes within the onshore and nearshore areas of San Luis Obispo and Santa Barbara Counties include Vandenberg Air Force Base and state tidelands development.

Vandenberg Air Force Base expansion will entail the construction of launch sites for the Space Shuttle and expansion of the boat dock at the old boathouse at Point Arguello. State tidelands leasing and development could lead to erection of oil and gas platforms from shore to three miles out between Point Conception and Point Arguello. Potential development on active OCS leases from Point Sal and Point Conception could add additional OCS structures between three and five miles from shore. Cumulatively, all these projects could add additional man-made features likely to degrade the scenic quality of the natural landscapes and seascapes of the Pacific coastal shorefront between Point Sal and Point Conception. The combined effect of all these projects is likely to add four or more nearshore structures in landscape units 27 and 28 (The Granville Corporation, 1981), which is likely to cause a significant adverse change to the natural character of the offshore viewshed between Point Sal and Point Conception. Other than recreational use associated with Point Sal State Beach, Ocean Beach County Park and Jalama Beach County Park, these landscape and seascape changes are unlikely to impact the quality of recreation or tourist experiences in the two county areas because the viewshed impacted is inaccessible to the general public.

Import tankering together with former leasing in addition to proposed Sale 73 is expected to cause at least six major oil spills over the next 40 years. Shoreline resources within and outside the proposed sale area are expected to be contacted between San Francisco and Santa Barbara and cause a short-term (up to several months) but significant visual degradation of the specific resources impacted.

Overall, a moderate long-term impact to visual quality is expected in the nearshore environment between Point Sal and Point Conception and a low to moderate short-term impact to localized areas affected by acute oil spills over the next 40 years along the Central California Coast. Proposed Sale 73 is likely to be responsible for one or two structures affecting the visual character of landscape units 27 and 28, but is unlikely to add significantly to the risk of major oil spills that visually impact the Pacific coast of Central California.

j. Impact on Cultural Resources

i. Discussion: The cultural resources subject to impact from offshore oil and gas development included prehistoric and historic sites, and areas of religious or ceremonial importance. Almost no work has been done offshore in Central California in regard to searching for prehistoric sites. There are no known and recorded submerged prehistoric sites, but numerous coastal eroding sites and coastal shell mounds are known.

The possibility of the existence of submerged prehistoric sites is suspected but high wave energies during transgression/regression episodes (sea level changes) may have destroyed any sites. Only sites in low energy areas such as lagoons and estuaries, and at low energy beaches are likely to have survived (MMS, 1982a). The difficulty in determining where sites might exist is in interpreting the geologic record of low energy areas back through the last 40,000 years.

Historic sites include both onshore National Register sites such as lighthouses, and sites offshore most of which are shipwrecks. Of the more than 1,500 recorded shipwrecks offshore California, over two-thirds are recorded north of Point Conception (MMS, Shipwreck File). This high number of wrecks is a function of the rocky coastline, the currents, and the frequent occurrence of inclement weather.

The main impacting agents to cultural resources are bottom disturbing activities, oil spills, onshore facilities, and the visual intrusion of offshore structures. (See Appendix A for a complete list of levels of impact to cultural resources and their definitions.)

Bottom Disturbing Activities. Bottom disturbing activities can include any activity utilizing anchors for stabilization; pipeline laying activities such as trenching, use of lay or pull barges; well drilling activities either during the exploration phase or during the development and production phase; and platform construction and anchoring. Additionally the placement of metal objects on the ocean floor (for example, pipelines, subsea completions, or lost equipment) may cover up the magnetic signature of historic resources during a magnetometer survey. Failure to identify a resource during the survey phase may lead to its inadvertent destruction during construction or exploration. A more detailed discussion is presented in the FEIS for Sale No. 53 (BLM, 1980a).

Oil Spills. Offshore oil and gas activities sometimes result in an accidental release of oil. Oil spills can impact cultural resources in several ways. These include direct oiling of the intertidal gathering areas, degrading the viewshed of any historic, prehistoric, religious or ceremonial site, direct oiling of sites and/or resources, and inadvertent destruction of sites during cleanup.

The intertidal areas are used extensively for gathering purposes by various groups of people. With the increased awareness of their cultural and spiritual past the Native Americans of California have an increased desire to collect, for ceremonial purposes, marine species that live in intertidal areas. In addition, there is an unknown number of Native Americans and other ethnic groups using the intertidal areas for subsistence gathering. The oiling of intertidal areas is covered in detail in Section IV.E.2.a.

Degrading the viewshed due to oil spills could change the National Historic Register criteria of a site, or could affect the religious or ceremonial significance to the groups who use the particular site.

Direct oiling of any sites or resources will cause damage due to the coating with the oil. This could interfere with dating methods and could disguise artifacts so they are not recognizable. The resources could be damaged or destroyed during cleanup operations depending upon the method of cleanup used. Additionally, cultural resource sites could be lost as a crisis atmosphere during the cleanup of an oil spill may preclude identification and avoidance of the site.

Beach fouling and surface slicks could result from chronic spillage. This would be relatively minor compared to the major accidents, but could be damaging to the cultural resources. The magnitude of these impacts would be comparable to those from the natural seeps. The overall imapct on the cultural resources would tend to be a degradation of the cultural resources at a particular site on a day-to-day basis, as is seen at present when the tar from the natural seeps impact the beaches in the Southern California area.

Onshore Facilities. All onshore surface-disturbing actions have the potential to destroy or disturb terrestrial prehistoric and historic sites. Activities with this potential include, but are not limited to, pipelaying activities, construction or expansion of support and processing facilities, and construction of temporary facilities for short-term projects.

Since State and local jurisdictions have primary authority over onshore development, it is assumed that their requirements for cultural resource protection will significantly reduce the likelihood of sites being disturbed or destroyed. There is always the possibility of undetected sites being destroyed during the construction process.

Offshore Structures. Offshore structures may impact the visual quality by intruding into the viewshed of onshore cultural resources. Visual impacts to National Register sites may occur if the introduction of intrusive or incongruent influences to the historic nature of the property changes the National Register criteria for the site. The visual intrusion of OCS development and exploration may impact the ceremonial and religious practice of Native American and other ethnic groups.

PROPOSED SALE AREA

Bottom Disturbing Activities. The bottom disturbing activities are anticipated to have a very low impact (No cultural resources likely to be present or disturbed.) as most of the shipwrecks in the area occurred close to shore, either off a point, harbor, or river bar (MMS Shipwreck File). Point Arguello has caused numerous wrecks and there is a potential for a moderate impact to historic resources if the anticipated pipeline is routed near the point. A low impact (Remote possibility of presence and disturbance of cultural resources.) is expected to cultural resources from the other pipeline which is anticipated to come ashore near Nipomo Mesa.

Oil Spills. One large oil spill is expected to occur in the Proposed Sale Area as a result of this proposal. If a spill occurs and contacts the shoreline, a temporary degradation may result, for the duration of the spill, to the viewshed of any historic or prehistoric sites in the contact area. The duration of the spill depends upon the size of the spill and the oil retention of the particular stretch of coastline. In the Proposed Sale Area the oil retention varies from several days at Point Arguello to over a year in Morro Bay (Woodward and Clyde, 1982).

Onshore cultural sites (see Section III.C.10) may be accidentally damaged or destroyed during the cleanup operations, and intertidal gathering areas may be fouled and rendered unusable as gathering areas. (The impacts to the intertidal areas are given in Section IV.E.5).

Submerged sites (see Section III.C.10) are not anticipated to be impacted by an oil spill unless the oil sinks and settles on the bottom, coating any artifacts which may be present. Oil spills, are expected to have a low impact to the cultural resources of the area.

Onshore Support Facilities. A very low impact is expected to the cultural resources in the area, as most facilities required for the development of the area will already be existing.

Offshore Structures. A very low impact on cultural resources in the Proposed Sale Area is anticipated from the intrusion of the five expected platforms into the viewshed of the cultural resources in the area. A moderate impact (significant possibility of both presence and disturbance of cultural resources.) is anticipated if the platforms are placed off Point Conception due to the Native American spiritual concerns.

AREAS OUTSIDE THE PROPOSED SALE AREA

Bottom Disturbing Activities. No bottom disturbing activities are proposed in the Santa Barbara Channel Area as a result of the proposal.

Oil Spills. One large oil spill is expected to occur in the Proposed Sale Area as a result of the proposal. There is a small probability that the spill will occur and strike the coast in the Santa Barbara Channel Area or northern Santa Maria Basins.

If a spill occurs and contacts the shoreline, a temporary degradation may result for the duration of the spill to the viewshed of any historic or prehistoric site in the contact area. The duration of the spill depends upon the size of the spill and the oil retention of the particular stretch of coastline. In the Santa Cruz Basin, the oil retention varies from several days at Pigeon Point to over a year in Elkhorn Slough (Woodward and Clyde, 1982).

Onshore cultural sites may be accidentally damaged or destroyed during the cleanup operations, and intertidal gathering areas may be fouled and rendered unusable as gathering sites. (The impacts to the intertidal areas are given in Section IV.E.2.a.)

Submerged sites are not anticipated to be impacted by an oil spill unless the oil sinks and settles on the bottom, coating any artifacts which may be present.

Any oil spill that occurs is expected to have a low impact to the cultural resource of the area.

If the expected spill contacts the Channel Islands or the Santa Barbara area, a moderate impact to the cultural resources in the area is expected. Cultural sites are known in the shallow areas along the coast, and the potential for impact exists.

Onshore Facilities. No onshore facilities are proposed outside of the sale area as a result of the proposal.

Offshore Structures. No offshore structures are proposed outside the proposed sale area as a result of the proposal.

Overall, a low impact to cultural resources is expected outside the proposed sale area as a result of the proposal.

ii. Conclusions: Low impacts (remote possibility of presence and disturbance of cultural resources) to cultural resources in Central California would be expected for the proposal. Localized moderate impacts (significant possibility of both presence and disturbance of cultural resources) could occur at Point Conception from offshore structures.

The impact to submerged resources is difficult to determine because of the lack of investigation for submerged resources undertaken in Central California.

An oil spill, if it occurs, may seriously impact the intertidal area (refer also to Section IV.E.3.a) and impact the subsistence and ceremonial gathering of Native Americans and other ethnic groups. The likelihood of oil spill related impacts is low.

iii. Cumulative Impacts: Impacts to cultural resources over the region occur both offshore and onshore from other projects and existing leases. The other projects include expansion of Vandenberg Air Force Base and the State Tidelands development. The Vandenberg expansion requires dredging at the old boathouse at Point Arguello, dumping of the dredge spoil offshore, and large onshore construction for roads, launch pads, and storage areas. All of these activities increase the potential impact to cultural resources. The State Tidelands development would have the same impacting agents as effect the OCS development, thus a low level of impact to cultural resources would be expected with development in State waters, except directly off Point Conception where a moderate impact would occur due to spiritual concerns of the Native Americans. The existing leases will have a similar expected level of impact in the region as the State Development.

k. Impact on Ports and Harbors

i. Discussion: The impacting agents that are associated with the proposal that may affect ports and harbors are: 1) additional vessel traffic (tankers, crew and supply boats), and 2) oil spills. The potential impacts that could occur as a result of these impacting agents are discussed below. This Section should be read in conjunction with Section IV. E.3.d.

Vessel Traffic. Additional tankering and support vessel activity is expected to result from the proposed lease sale. Existing traffic levels are given in Section III.C.12. The increased use of tankers to transport OCS crude oil into and out of ports (i.e., San Francisco Bay Area, and/or Gulf of Mexico Galveston), and the increased use of crew and supply boats would have an associated number of space-use conflicts within the ports and harbors. Vessels require a number of support facilities and berthing space. All new facilities or expansions must be in compliance with state and local jurisdictions planning and zoning policies (local coastal plans, Port San Luis Master Plan, etc.). If local planning or zoning does not provide for a particular use, that is a point of negotiation between the requesting company and the local jurisdiction (Also see Section I.A.). Also refer to Sections IV.E.3.d (Coastal Land use) and IV.E.3.e (Commercial Fisheries).

Oil Spills. The probability that a large oil spill will occur and contact a port or harbor in Central California is very small (7 percent probability of contact with Port San Luis within 3 to 30 days; less than 2 percent probability of contact with all other ports or harbors in Central California). Therefore, no impacts as a result of oil spills are expected. In the unlikely event that an oil spill threatened a port or harbor, deployment of containment booms or other oil spill equipment could delay vessels from entering or departing the port or harbor.

These impacting agents could result in high impacts to ports and harbors (i.e. Port San Luis or an alternative site that is approved by state and local planning jurisdictions) in Central California. These impacts are expected primarily due to competition for vessel berth space and support facilities and the need for additional docks, berths, and facilities. See Appendix A for definitions of all impact levels.

PROPOSED SALE AREA

According to the Hypothetical Transportation Scenario (see Section II.A.1.d), twenty-five percent of the crude oil produced in this Basin would be tankered from Gaviota (or the eventually selected location) to San Francisco, 25 percent would be tankered from Gaviota to the Gulf of Mexico (Galveston) and the remaining 50 percent would be transported from Gaviota via onshore pipeline to Los Angeles. Since Gaviota is located in the Santa Barbara Channel, potential impacts will be discussed in the "Areas Outside the Proposed Sale Area" section below.

Vessel Traffic. Additional support vessel traffic expected to occur as a result of selection of Alternative I is as follows: Crew boats will be used to transport personnel to and from wellsites or platforms from Port San Luis according to the Transportation Scenario (Section II.A.1.d.). In the southern Santa Maria Basin, one trip per day per wellsite is predicted to be made during exploratory and development phases of the proposal. One trip every other day would be made (per platform) during production. Supplies taken to the wellsite or platform would originate from Gaviota. One trip per two days (per wellsite or platform) is expected to be made by a supply boat during the exploratory production phases. One trip per day would be made in the development phase. The values for crew boat trips compare to those estimated in San Luis Obispo Planning Dept. (1983) (Draft Crewbase Siting Study).

Offshore infrastructure in the Santa Maria Basin expected to result from Alternative I includes 12 exploratory wells, nine delineation wells, and five platforms with 155 development wells. An assumed to be existing marine terminal would lie just offshore Gaviota (see Section II.A.1.d.). An assumed existing supply boat base would exist at Gaviota. A crew boat base would be built (Yamasaki, 1983) at Avila Bay (Port San Luis).

Due to exploration, development and production activities of prior federal leases sales in this area (i.e. Sale 53 and RS-II), the additional activities and requirements of the present proposal (described above) will necessitate the need for a new crew base. Heavy equipment and large quantities of supplies would be handled out of existing (Port Hueneme) or assumed to be existing (Gaviota) facilities or supply bases. The likely location for this crew base is Port San Luis, due to its proximity to the lease area. The oil industry would need to invest money into constructing new docks, berths and other facilities for the crew base. Any use or development of Port San Luis must be in compliance with local jurisdiction policies and zoning. The Board of Supervisor's approved Local Coastal Plan (LCP) allows for Port San Luis to be used as a crew boat base if certain prior criteria are met and complied with. If a crew base is not allowed in San Luis Obispo County, the oil companies may exercise options of helicoptering crew members, using supply boats to transport crew members, using long work tours, etc. The specific company option chosen will be identified as part of the Plan of Exploration or Plan of Development submitted prior to drilling or development activity. These plans would be subject to the review and approval of state and local jurisdictions. Development of a crew base at Port San Luis would require a Development Plan which must include a detailed examination of alternate sites from Port San Luis south to the Santa Barbara Channel, a phasing plan for development, oil spill contingency plans, a fire protection plan and an identification of necessary buildings and facilities and potential siting locations. This last item is to conform with County policy to site all but the most necessary industrial facilities away from the coastline.

In addition any harbor improvements would have to be done so as to minimize conflicts with recreational and commercial fishing uses. Study of the feasibility of improving the present level of facilities and moorage for recreational and commercial fishing boats is required. No service (crew) base would be permitted north of Point San Luis unless alternate sites are more environmentally damaging or environmental impacts are mitigated to the maximum extent feasible. Compliance with established county policies would mitigate the land use impacts of establishing a crew base at Port San Luis.

The estimated space needed for crewboats and supply boats as a result of Sale 73 is given in Table IV.E.3.k-1.

High impacts (i.e., requirement for additional docks, berths, and facilities) will occur to Port San Luis or alternative sites. Evaluations of alternative sites will be conducted by the San Luis Obispo Planning Department and other appropriate agencies. All new facilities or expansions must be in compliance with local jurisdiction planning and zoning policies.

AREAS OUTSIDE THE PROPOSED SALE AREA

Impacts within the Southern California area are as follows.

Vessel Traffic. Twenty-five percent of the crude oil produced in the southern Santa Maria Basin would be tankered to San Francisco, 25 percent would be tankered to the Gulf of Mexico (Galveston) and the remaining 50 percent would be transported from Gaviota via onshore pipeline to Los Angeles, according to Transportation Scenario No. 1. All proposal-associated tankers shall conform with all standards established for such vessels, pursuant to the Port and Tanker Safety Act of 1978. A total of 39 round trips per year from Gaviota to San Francisco are expected to be made in the peak year of production (1993) by a 27,000 DWT tanker in Alternative I. This is based on an estimated peak oil flow rate of 21,075 bbl/day. The total distance traveled in this peak year by these tankers would be 23,088 miles. A total of eight round trips per year from Gaviota to the Gulf of Mexico (Galveston) are expected to be made the peak year of production (1993) by three 45,000 DWT tankers in Alternative I (i.e., 24 total round trips). This is based on an estimated peak oil flow rate of 21,075 bbl/day. The total distance traveled in the peak year by these tankers would be 211,200 miles. Additional support is as described above. Impacts to the assumed to be existing Gaviota crew and supply boat base are not expected to be significant.

ii. Conclusion: High impacts to Port San Luis (or an alternative site that is approved by state and local planning jurisdictions) would be expected, primarily due to competition for vessel berth-space and support facilities. This competition would lead to the need for additional docks, berths, and facilities. The additional vessel traffic and needs resulting from the proposal would only have a very low impact at the Port of San Francisco.

iii. Cumulative Impacts: Cumulative impacts to ports and harbors as a result of other projects (Section IV.D), oil spills from existing leases and import tankering, and future increases in space and use demands will create additional conflicts at the ports and harbors. Without the proposal, it appears that adequate crew base facilities to support existing Western Santa Barbara Channel and Santa Maria Basin hydrocarbon activities can be incorporated into the assumed to be existing consolidated Gaviota site (or an alternative site that is eventually selected). The proposal would necessitate the need for additional crew base facilities. The estimated cumulative space needs for crew boats and supply boats in the Sale Area are given in Table IV.E.3.k-1. Since exploration, development and production activity is a significant impact producing agent to ports and harbors, the proposal pro-

TABLE IV.E.3.k-1

ESTIMATED SPACE NEEDED FOR CREW BOATS, SUPPLY BOATS & PROCESSING PLANTS

SALE NO.	CREW BOATS		SUPPLY BOATS(2)		HYDROCARBON PROCESSING PLANTS (ACRES)	
	DOCKING SPACE (LINEAR FEET)[1]	CAR PARKING (ACRES)	DOCKING SPACE (LINEAR FEET)[1]	CAR PARKING (ACRES)	Gaviota[4]	Nipomo Mesa[4]
73	100 to 500	1.0	200 to 1000	0.3	2.4	1.6
53 Leased[3]	100 to 400	0.8	200 to 800	0.2	1.2	0.8
RS-2 Leased	100	0.2	200	0.1	0.2	0.1

NOTES:

[1] Depending on joint space usage

[2] Dock storage space not estimated

[3] Included at the assumed existing Gaviota site (see Section II.A.1.d.)

[4] Assumed existing (see Section II.A.1.d.)

vides a substantial contribution to cumulative impacts to this resource category. The selection of Alternative I will lead to additional tankering and support vessel activity, and an associated number of space use conflicts.

The contribution of the proposal to the cumulative probability of oil spills occurring and contacting a port or harbor is very small, as discussed in the beginning of this section. The greatest contribution to the cumulative number of oil spills is from existing federal leases and import (Alaska or foreign) tankering. The probability that a large oil spill from existing federal leases and import tankering will occur and contact the opening of San Francisco Bay is 29 percent within 3 days and 35 percent within 10 and 30 days. The addition of proposal-related spills does not significantly change these numbers. The numbers for Moss Landing are 2 percent within 3 days, 9 percent within 10 days, and 11 percent within 30 days. The addition of proposal-related spills does not change these numbers. No spills from existing leases and import tankering are expected to occur and contact Port San Luis or Morro Bay. The probability that a large oil spill from the combination of the proposal, existing leases, and import tankering will occur and contact Port San Luis is similar to that for the proposal (7 percent in 3 and 10 days; 8 percent in 30 days); the same for Morro Bay (1 percent in 3 days, 2 percent in 10 days and 4 percent in 30 days).

l. Impact on Marine Traffic

i. Discussion: Marine traffic refers to large commercial vessels which travel in California offshore waters. This traffic is bound to or from ports in California, Oregon, Washington, British Columbia, Alaska, the Gulf of Mexico, Japan, China, Singapore or other foreign ports. This traffic is composed of large vessels including tankers, container ships, freighters, dry bulk carriers, auto carriers, lumber ships, and passenger ships.

The impacting agents that are associated with the proposal that may affect marine traffic are: 1) additional vessel traffic (i.e., tankers, crew and supply boats, geophysical survey vessels), and 2) offshore structures (exploratory rigs, platforms, and subsea completion systems). The potential impacts that could occur as a result of these impacting agents are discussed below:

Vessel Traffic. Additional vessel traffic such as tankers, crew and supply boats, and geophysical survey vessels are expected to be used as a result of the implementation of Alternative I. When these vessels use or traverse traffic lanes which cross the proposed leasing area, potential conflicts could occur. These conflicts include collisions and vessel rerouting. Further conflicts arise when vessels do not adhere to traffic lanes.

Maritime military operations also occur throughout much of the proposed leasing area. In the event that hydrocarbon-related activities occur in military operating areas, further conflicts (i.e., collisions, vessel rerouting) could occur (see Section IV.E.3.o).

In the event that there were a collision between a large vessel (e.g. a tanker) and an offshore oil platform, or a collision between two large vessels, a large oil spill, a loss of lives, and loss of equipment would occur.

Offshore Structures. Exploratory drill ships, platforms, and subsea completion systems are expected to be used as a result of the implementation of Alternative I. Structures such as platforms could pose either a positive or negative impact to marine traffic. In a study conducted by the Transportation Systems Center, it was determined that 78 percent of all tanker vessel casualties in U.S. waters involving rammings, collisions, and groundings took place at night or during periods of reduced visibility (U.S. Dept. of Commerce, 1981a). While reduced visibility has the potential of increasing the number of collisions between vessels and offshore structures, platforms could also provide a benefit for safe navigation due to navigational aids that are mandated by U.S. Coast Guard.

The U.S. Dept. of Commerce (1981a) conducted a computer simulated study of vessel movements around offshore structures in the Santa Barbara Channel. When structures were placed (simulation) near the border of a traffic lane, vessel operators often performed evasive actions which increased the risk of collision with other vessels. The risk was increased when structures were located on opposite sides of the traffic lane so as to form a "gated" configuration. The occurrence of such evasive maneuvers was considerably decreased by the placement of structures outside the 500 meter buffer zone, as well as when no permanent or temporary structures were placed within 1,000 meters of the boundary of the traffic lane for two miles either side opposite of the structure bordering the lane (U.S. Dept. of Commerce, 1981a).

The analysis that follows is based on McMullen (1977). Also refer to BLM (1980, 1981). In this discussion, "casualty" is defined as an incident which could range from dents and scrapes to total loss of the vessel. "Severe casualties" could result in an oil spill, loss of life, or loss of the vessel.

Impacts to Central California marine traffic from proposal-related vessel traffic and offshore structures are expected to be low. Low impacts to this resource category means that vessel conflicts occur, but they are minor in character and are infrequent. (See Chapter IX for definitions of all impact levels for this resource.) Assuming an average of 30 tanker round trips per year from Gaviota over the Proposed Sale No. 73 20-year development period, the statistically expected number of tanker casualties would be 0.05. A total of 0.01 severe casualties would be expected.

Implementation of the proposal is expected to displace an amount of Alaskan North Slope (ANS) crude equal to the amount of proposal crude that is refined in California. This would proportionately reduce the number of trips made by tankers transporting ANS crude to the Ports of San Francisco Bay and Los Angeles -Long Beach. About 7.7 million bbls of proposal crude is estimated to be tankered to San Francisco per year. Currently, about 85 million bbls (CEC,1983) of ANS crude goes into San Francisco. Thus, about 10 percent of the ANS crude could be displaced, thereby reducing Alaskan tanker trips to San Francisco by a proportionate amount. About 15.4 million bbls of proposal crude would be piped to Los Angeles refineries per year. Currently, about 110 million bbls (CEC, 1983) of ANS crude goes into Los Angeles. Thus, about 14 percent of the ANS crude could be displaced, thereby reducing Alaskan tanker trips to Los Angeles by a proportionate amount.

PROPOSED SALE AREA

According to the Transportation Scenario for this Sale (see Section II.A.l.d.), 25 percent of the crude oil produced in this basin is anticipated to be tankered from Gaviota (or an alternative site) to San Francisco, 25 percent would be tankered from Gaviota to the Gulf of Mexico (Galveston), while the remaining 50 percent would be transported from Gaviota via onshore pipeline to Los Angeles. Since Gaviota is located in the Santa Barbara Channel, potential impacts will be discussed in the "Areas Outside the Proposed Sale Area" section below. This is a hypothetical distribution of the crude which is used for analytical purposes in this document. At the actual time of production, the crude oil from this proposal could be distributed differently. This scenario would be discussed in a Plan of Development and Environmental Impact report submitted in the post-lease phase. All proposal-associated tankers shall conform with all standards established for such vessels, pursuant to the Port and Waterworks Safety Act-1978.

Vessel Traffic. Additional support vessel traffic expected to occur as a result of selection of Alternative I is as follows: Crew boats will be used to transport personnel to and from exploratory sites or platforms from Port San Luis according to Transportation Scenario No. 1 (Section II.A.1.d.). In the Proposed Sale Area, one trip per day, per wellsite, is predicted during exploratory and development phases of the proposal. One trip every other day would be made (per platform) during production. Supplies taken to the wellsites or platform would originate from Gaviota. One trip per two days (per wellsite or platform) is expected to be made by a supply boat during the exploratory and production phases. One trip per day would be made in the development phase.

Proposal related tanker traffic emanating from Gaviota would cross the proposed sale area. A description of the volume of expected traffic and potential casualties is discussed in "Areas Outside The Proposed Sale Area", below.

Offshore Structures. Offshore structures in the southern portion of the Santa Maria Basin that are anticipated to result from the implementation of Alternative I include 12 exploratory wells, nine delineation wells, and five platforms with 155 development wells. An assumed to be existing marine terminal would lie just offshore Gaviota. An assumed to be existing supply boat base would exist at Gaviota. A crew boat base is anticipated to be constructed at Avila Bay (Port San Luis or any alternative crew base site that may be approved by local planning jurisdictions). Based on the presence of five platforms and a 20-year production period, the statistically expected number of platform-large vessel collisions would be 0.05. Therefore there is a 95 percent likelihood that there would be no collisions between vessels and platforms over the lifetime of the proposal.

Low impacts to marine traffic are expected to occur as a result of additional vessel traffic and offshore structures that are associated with the implementation of Alternative I.

Use of the Information to Lessees that is described in Section II.A.1.f. would make potential bidders and lessees aware of lease restrictions on surface activities within future safety fairways, traffic lanes, or precautionary areas.

AREAS OUTSIDE THE PROPOSED SALE AREA

At the present time, an average of ten large vessels per day arrive at the San Francisco Bay. Proposal-related tankering from Gaviota (peak year) would add about 3 percent to the present traffic that enters the Bay through the Coast Guard designated Port Access Route. No impacts to marine traffic north of San Francisco are expected.

Impacts within the Southern California area are as follows:

Vessel Traffic. According to the Transportation Scenario for this sale (Section II.A.1.d.), 25 percent of the crude oil produced in the Santa Maria Basin is anticipated to be tankered from Gaviota (within the Santa Barbara Channel) to San Francisco, 25 percent would be tankered from Gaviota to the Gulf of Mexico (Galveston) and the remaining 50 percent would be transported from Gaviota via onshore pipeline to Los Angeles. A total of 39 round trips per year from Gaviota to San Francisco are expected to be made in the peak year of production (1993) by a 27,000 DWT tanker in Alternative I. This is based on an estimated peak oil flow rate of 21,075 bbl/day. The total distance traveled in this peak year by these tankers would be 23,088 miles. A total of eight round trips per year from Gaviota to the Gulf of Mexico (Galveston) are expected to be made in the peak year of production (1993) by three 45,000 DWT tankers in Alternative I (i.e., 24 total round trips). This is based on an estimated peak oil flow rate of 21,075 bbl/day. The total distance traveled in the peak year by these tankers would be 211,200 miles.

Additional support vessel traffic expected to occur as a result of selection of Alternative I is as follows: Crew boats will be used to transport personnel to and from wellsites or platforms either from Port San Luis or Gaviota according to Transportation Scenario No. 1. In the Santa Barbara Channel, one trip per day per wellsite are predicted to be made during exploratory and development phases of the proposal. One trip every other day would be made (per platform) during production. Supplies taken to the wellsites or platform would originate from Gaviota. One trip per two days (per wellsite or platform) is expected to be made by a supply boat during the exploratory and production phases. One trip per day would be made in the development phase.

Assuming an average of 30 tanker round trips per year emanating from the western Santa Barbara Channel over the Proposed Sale No. 73 20-year development period, the statistically expected number of tanker casualties would be 0.05. A total of 0.01 severe casualties are expected. The probability of casualties would be highest in the peak year of production (1993) when 63 tanker round trips are predicted. The total number of casualties in the peak year would be 0.005; for severe casualties, 0.001.

Low impacts to marine traffic outside the proposed sale area (Gaviota, San Francisco) are expected to occur as a result of additional vessel traffic and offshore structures that are associated with Alternative I.

ii. Conclusion: Low impacts to marine traffic in Central California and the Santa Barbara Channel area would occur as a result of additional vessel traffic and offshore structures that are associated with Proposed Sale No. 73, Alternative I. Low impacts to the resource category means that vessel conflicts occur, but they are minor in character and they are infrequent.

iii. Cumulative Impacts: Cumulative impacts on marine vessel traffic as a result of other projects, (Section IV.D), and future increases in marine traffic, could result in more vessel-vessel and/or vessel-structure incidents. Without the implementation of the proposal, increases in marine vessel traffic and surface structures will result in more vessel-vessel and/or vessel-structure incidents. Increases in marine vessel traffic are expected to occur as a result of future planned projects (see Section IV.D.) and future increases in commercial, military, and private marine traffic. Predicted increases in the sale area include the following: (see Table IV.D.4-1): 1) Federal leased lands - over 45 exploration wells and over 10 platforms; 2) Proposed State Tidelands Lease Sale - Pt. Conception to Pt. Arguello - 25 exploration wells, 6 platforms, and one marine tankering facility. The total existing and known future exploration and development activities in state and federal waters offshore Central and Southern California are: over 526 exploration wells, over 59 platforms, over 7 artificial islands, and over 21 marine tankering facilities. The cumulative effect of these increased hydrocarbon activities could result in moderate impacts on vessel traffic. Without the proposal, there would be no potential, proposal-related benefits of displacing Alaskan North Slope crude. The potential for these incidents would be greatest in Central California and the Santa Barbara Channel where vessel traffic is the greatest. Moderate impacts are likely in Central California and the Santa Barbara Channel. Once the Eleventh and Twelth Coast Guard Districts' recommended TSS modifications and additions (see Section III.C.12) are approved, there would be a reduction in the likelihood for these types of incidents. These measures would not permit surface hydrocarbon operations (drilling) within the proposal precautionary areas, safety fairways, or vessel traffic lanes.

The estimated number of vessel accidents during exploration, development, and production activities of the proposed sale should be low if U.S. Coast Guard policy is followed. Presently, this policy does not permit surface hydrocarbon operations (drilling) within Precautionary Areas, safety fairways, or vessel traffic lanes. In the event hydrocarbon operations are permitted within the proposed vessel traffic lanes and precautionary area in the southern lanes and precautionary area in the southern Santa Maria Basin, potential impacts on shipping could be: high economic losses to the shipping and oil industries, loss of lives, and increased probability of a large oil spill.

Since exploration, development, and production activity is a significant impact producing agent to marine traffic, the proposal provides a significant contribution to cumulative impacts to this resource category. However, implementation of the proposal is not likely to shift the impact level on marine traffic from moderate to high.

m. Impact on Refineries

i. Discussion: A total of 40 refineries exist (Table III.C.13-1) in California with a total refining capacity of 2.5 million barrels per calendar day (bcd). About 60 percent of the total refining capacity resides in the Greater Los Angeles area. According to the Transportation Scenario developed for this proposal (see Section II.A.1.d and Yamasaki, 1983), 25 percent of the produced oil would be tankered to the Gulf of Mexico for refining, while 75 percent of the crude would be refined in California refineries (50 percent in the Los Angeles area and 25 percent in the San Francisco area). This is a hypothetical distribution of the crude which is used for analytical purposes in this document. At the actual time of production, the crude oil from this proposal could be distributed differently. The impacting agent, associated with the proposal that may affect California refineries is sour (high sulfur) and heavy (low API) crude oil. The presence of heavy metals (e.g. vanadium) in crude oil would also affect the refineries. Several processes are required to turn this quality of crude into a saleable product. These processes include catalytic hydrocracking, fluid catalytic cracking, delayed coring, fluid coring, flexicoring and pyralisis. The recovery of heavy metals (e.g. vanadium) from petroleum by-products would require additional new processing. Impacts to the refineries would occur when the plant is not equipped to process low quality crude oil.

California refineries are assumed to have the capacity and capability to process proposed Sale 73 crude oil by the time it is piped or tankered to them (1988 is expected)(Also see Yamasaki 1983). Twenty-five percent of the production is estimated to be of such quality that it would be tankered to the Gulf of Mexico for refining. No new refineries are expected to be built as a result of this proposal. This is based on existing refining capacity and the assumption that Sale 73 production that is refined in California would displace Alaskan North Slope (ANS) crude. It is thought that California offshore crude will be priced such that it will be purchased in preference to ANS crude.

The estimated properties of proposed Sale 73 crude are given in Section II.A.1. The presence and/or amount of heavy metals is not known. A percentage of the crude is estimated to be relatively sour (high sulphur) and heavy (low API gravity). Therefore, this low quality crude oil would represent a partial contribution to the overall need for expensive modifications to the refining process. Bechtel (1982) has studied the feasibility of modifying Southern California refineries to process crude oil with the properties (17.4 API, 4.9 percent sulphur, 0.7 percent nitrogen, and 768 ppm metals) of Hondo "A" (western Santa Barbara Channel) crude. This study recommended that the following new process units would be required to process this type of crude: vacuum unit, coker, hydrocracker, HGO hydrotreater, hydrogen production and sulphur plant. Although the precise quality of Sale 73 crude is not known at this pre-leasing stage, it is likely that similar modifications would be needed to handle portions of this and other California offshore crude. The quality of at least some of the crude oil from previous federal lease sales (e.g. Sale Nos. 1968, 35,48, 53, 68 and RS-II), the proposed State of California Lease Sale (Pt. Arguello to Pt. Conception) in August, 1983, and future federal lease sales (Sale No. 73, Proposed Southern California Lease Offering - February, 1984) has either proven to be or is expected to be low.

Twenty-three refineries are presently capable of refining some OCS crude (Hondo "A" quality)(3 in the Central Valley, 6 in Northern California, and 11 in Southern California)(California Energy Commission, 1983). This presently represents a 99,300 bcd capability for OCS crude of Hondo "A" quality. Sale 73 crude averages 24° API gravity and 4 percent sulphur.

The move by refiners to make modifications to handle this quality of crude is evident in California. Last year, Shell Oil Co. started the first phase of an $800 million program to modernize its U.S. West Coast refining system to handle low quality crudes (Oil and Gas Journal, September 13, 1982). The estimated cost of these modifications is $800 million. Union Oil Co. is also modifying their Los Angeles (San Pedro) refinery. The estimated cost of the modifications is $12 million.

Recently, many studies have been conducted to analyze the ability of California refineries to handle low quality crude oil. For example, Bechtel (1982) has completed an analysis of the refinery flexibility in Southern California. Bechtel analyzed a scenario which included the peak (1993) production from the Santa Maria Basin (i.e., federal Lease Sale No. 53 plus the proposed offshore State Tidelands parcels between Pt. Conception and Pt. Arguello) and the Santa Barbara West Channel (exclusive of Hondo "A" production). The level of this production was estimated at 325,000 bcd. Major findings of this study were 1) displacement of ANS crude by OCS and State Tidelands crude oil would necessitate extensive retrofitting of the refineries in the Los Angeles Basin (see the Bechtel study for details on the types of modifications needed); 2) retrofitting of the Los Angeles Basin refineries for the 325,000 bcd peak production rate would cost about $1.9 billion in capital costs plus an additional $270 million per year in operating expenses (mid-1982 dollars); and 3) if permits could not be obtained (e.g., Air Quality permits - see Section III.A.9 and IV. E.1.c) and/or cost constraints prevented timely refinery retrofitting, crude could be transported to other areas. These conclusions were drawn on a worst-case scenario that all the crude production would exhibit the low quality of Hondo "A" crude.

At this time, MMS estimates (see Section II.A.1) that the crude produced as a result of the current proposal would show an average API gravity of 24 and an average sulphur (percent weight) of 2.5. No estimates of metal content have yet been made. Thus, at this early stage in the leasing, exploration and development stage, the average quality of this proposal-related crude appears to be better than that being found at Hondo "A". Furthermore, the MMS Transportation Scenario assumes that 25 percent of the total production from the proposal would be of such quality that it would be tankered to the Gulf Coast for refining.

Another study on refining OCS crude in California was conducted by the California Energy Commission (CEC)(Felts, 1983). The CEC study analyzed the same scenario as did Bechtel (i.e., 325,000 bcd peak production (1993) of low quality crude). The CEC concluded that 1) the cost of providing equipment to upgrade federal OCS and State Tidelands crude to Alaskan North Slope quality is technically and economically feasible, assuming that there are no major delays in permitting the refinery modifications; 2) in order to minimize the modification costs, it is essential that oil companies and permitting agencies work together to coordinate a plan to develop production and refining systems for OCS crude so that implementation may begin in a reasonable time frame.

The economic feasibility of retrofits is partially based on the price structure ratio between California OCS crude and Alaskan North Slope crude. Current estimates (e.g. Felts, 1983; Dames and Moore, 1982) are that California OCS crude would be priced such that it would be purchased in preference to ANS crude.

Felts (1983) estimated that California OCS crude could be about $8/barrel below the cost of ANS crude. Thus it appears that the incentive exists for refiners to make the necessary refinery modifications to handle future California crude productions.

In the future, California refineries will need to make large investments in order to process low quality crude oil (from past and future offshore California oil lease sales). At this time, these modifications appear to be technically and economically feasible for the refiners.

The present proposal would partially contribute to the need for the refinery modifications, based on peak production value (in 1993) of 63,288 bcd (this assumes that 25 percent of the production is tankered to the Gulf for refining). As pointed out previously, it is not precisely known what the quality of the proposal crude would be. Some of the crude oil from past and future (both federal and state) offshore lease sales has either proven to be or is expected to be of low quality. California refineries will need to make expensive modifications to the refining process in order to process the sum total of this crude production. It is assumed that Alaskan North Slope crude would be displaced in an equal amount to the offshore California crude produced and refined in California. The proposal would partially contribute to the need for these modifications to handle the expected low quality crude oil. This partial contribution to the overall inducement of refinery modifications is considered to be a low impact to refineries (see Chapter IX for a definition of impact levels for this resource category).

In the event that the proper permits for retrofitting cannot be obtained from state and local governments, or if retrofitting proves to be economically infeasible, then some of the crude production (in excess of the 25 percent anticipated) would need to be shipped to the Gulf of Mexico for refining. This would result in additional navigational conflicts, a reduction in the number of expected oil spills (since the spill rate for tankering is lower than for pipelines), and an increase in the potential for a large oil spill (since a spill from a tanker would likely be larger than one from a pipeline).

PROPOSED SALE AREA

Proposed Sale No. 73 crude oil is not anticipated to be handled at refineries in the proposed sale area (Yamasaki, 1983). Therefore, there would be no proposal-related impacts to refineries in this area.

AREAS OUTSIDE THE PROPOSED SALE AREA

A portion (about 25 percent) of the crude oil that is produced from the proposed sale area would be tankered to the San Francisco refineries. This crude is expected to represent a partial contribution to the need for modifications to the refining process (see discussion above). This is considered to be a low impact to individual refineries in this area.

A certain amount (50 percent) of crude oil from the proposal is expected to be transported to the Los Angeles area refineries. This crude is expected to represent a partial contribution to the need for modifications to the refinery process (see discussion above). This is considered to be a low impact to individual refineries in the Los Angeles area.

ii. Conclusions: If California refineries have the capacity to process all Proposed Sale No. 73 crude oil that is shipped or piped to them (25 percent of the production would be tankered to the Gulf Coast for refining) (Yamasaki, 1983), then the proposal partially contributes to the overall inducement of California refiners to make expensive modifications to the refining process to handle low quality crude oil from past and future (federal and state) offshore lease sales. This is considered to be a low impact to California (Greater Los Angeles area and San Francisco area) refineries.

In the event that California refineries are not able to process Sale 73 crude production, then some of the crude (in excess of the 25 percent anticipated) would need to be tankered to the Gulf of Mexico for refining. Therefore, there would be no need for new refineries to be constructed.

iii. Cumulative Impacts: Cumulative impacts on refineries as a result of other projects (Section IV.D.), and future increases in oil production would result in high impacts to refineries. At this time, it is thought (Felts, 1983; Dames and Moore, 1982) that Alaskan North Slope (ANS) crude oil could be displaced from the California refinery slate due to the lower cost of offshore California crude. Due to this lower cost of California crude, there would be economic incentives for the refineries to make modifications to handle low quality crudes. Not including future federal lease sales, Felts (1983) estimates that $14 billion could be realized by California refiners processing offshore California crude in place of ANS crude. This is based on an estimated minimum refining advantage of $8/bbl for refining OCS crude in place of ANS crude and a total of 1.8 billion bbls of offshore California crude. Future federal and state offshore lease sales make this venture even more economically feasible. Environmental offsets could reach $1 billion (Bechtel, 1982). Thus, at this time, it appears economically feasible for California refiners to make the needed retrofits. A comparison between Sale 73 estimated peak oil production (bcd) and the California refinery maximum daily capacity is given in Table IV.E.3.m-1. The data presented are based on the assumption that retrofits will be done on some or all of the refineries. The proposal would not shift impacts on refineries from high to very high. In the event that the proper permits for retrofitting cannot be obtained from state and local governments, or if retrofitting proves to be economically infeasible, then some of the crude production would need to be shipped to the Gulf of Mexico for refining. This would result in additional navigational conflicts, a reduction in the number of expected oil spills (since the spill rate for tankering is lower than for pipelines), and an increase in the potential for a large oil spill (since a spill from a tanker would likely be larger than one from a pipeline).

n. Impact on Offshore Structures

i. Discussion: This resource category includes platforms, subsea pipelines, exploratory drill ships, SALMs, OS&Ts, and marine terminals. These structures are located in both State and Federal waters. As discussed in Chapter III.C.14, the only existing offshore structures in Central California are exploratory drillships in the southern Santa Maria Basin, marine terminals located between Monterey Bay and Avila Bay (refer to Visual No. 2,

TABLE IV.E.3.m-1

COMPARISON BETWEEN SALE 73 ESTIMATED DAILY PEAK OIL PRODUCTION AND CALIFORNIA REFINERIES MAXIMUM DAILY OIL PRODUCTION CAPACITY

Proposed sale daily peak oil production (barrels per day)	Refineries: Locations	Refineries: Maximum daily Oil Production capacity (barrels per day)	Percent of proposed sale daily peak oil production to maximum daily oil production capacity
21,075	San Francisco Bay Area	812,000	2.6
42,150	Los Angeles Basin	1,374,295	1.5
21,075	Gulf Coast	-------	---
589,475	San Francisco Bay Area	812,000	73
1,004,150	Los Angeles Basin	1,374,295	73
	Gulf Coast	-------	---
61,975	San Francisco Bay Area	812,000	7.6
123,950	Los Angeles Basin	1,374,295	9.0
61,975	Gulf Coast	-------	---
630,375	San Francisco Bay Area	812,000	78
1,085,950	Los Angeles Basin	1,374,295	79
	Gulf Coast	-------	---

NOTES 1. * Assumed refineries operating at 70% capacity (1982)

BLM, 1980), and the subsea pipelines which are associated with the terminals. An abundance of structures are concentrated in the Santa Barbara Channel (see Transportation mini-visual, BLM, 1981a).

The impacting agents that are associated with the proposal that may affect existing offshore structures are: 1) platform and pipeline installation activities, and 2) additional vessel traffic (refer to IV.A.5 and 6). The potential impacts that could occur as a result of these impacting agents are discussed below:

Platform and Pipeline Installation Activities. Existing subsea pipelines could be impacted by the anchoring activities of pipeline installation barges and the smoothing of anchor scars by dragging chains or bars along the ocean bottom. Since barge operators are made aware of the presence of subsea pipelines, the likelihood that these types of impacts would occur is very low. Barge operators exercise extreme caution when such activities take place near subsea pipelines.

Vessel Traffic. Vessel traffic such as crew and supply boats and tankers will be traversing offshore areas of exploration and development and could interfere with existing offshore structures. Additionally, seismic boats will also be operating in these areas. During periods of adverse weather conditions (e.g. storms or dense fog), there will be an increased risk of collision with existing structures. Such incidents could result in oil spills, loss of human lives, and loss of equipment. However, the probability is very low that these events would occur in Central California.

Collisions between small vessels, such as crew boats or supply boats, and platforms, represent little structural risk to the platform because of the disparity in size (National Research Council, 1981). While these small vessels are the ones most likely to be involved in collisions with offshore installations, the risk of collisions between large ships and offshore installations is growing commensurate with the increase in offshore activity, as evidenced by the proliferation of offshore installations and higher volumes of marine traffic. From an engineering standpoint, it is impractical to design a platform to be able to withstand head-on impact from a moving ocean-going vessel. The only procedure that can eliminate the risk of collision is to ensure that vessels do not operate in areas of offshore platforms. As platforms have evolved through the years, they have gradually become larger, heavier, and stronger. As such, while not able to withstand a collision from a ship, today's platforms have reached the point where as the result of the collision the ship also withstands major damage. Due to this fact, ship operators appear to be exercising more caution than in the past when operating in areas of offshore oil and gas activity (National Research Council, 1981).

In the event that there were a collision between a large vessel (e.g., a tanker) and an offshore oil platform, a large oil spill, a loss of lives, and a loss of equipment would occur.

PROPOSED SALE AREA

Subsea pipelines which are associated with marine terminals near Morro Bay and Port San Luis could be impacted as described above. However, it is unlikely that these impacts would occur. Therefore, no impacts are expected to existing offshore structures in this basin.

AREAS OUTSIDE THE PROPOSED SALE AREA

Although subsea terminals are associated with marine terminals in Monterey Bay, no impacts are expected to occur due to exploration and development activities being restricted to the proposed sale area.

Impacts within the Southern California area are as follows:

Vessel Traffic. Structures in the Santa Barbara Channel include platforms, subsea completion systems, pipelines, an offshore separation and treatment (OS&T) vessel, and exploratory rigs. Impacts to these existing oil and gas structures will occur in the Santa Barbara Channel as a result of additional vessel activity from the proposal (Alternative I). Low impacts from additional vessel activity are expected to occur to offshore structures within this channel.

ii. Conclusion: Impacts to offshore structures will be confined to the Santa Barbara Channel, since the only existing platforms are in this area. These impacts are expected to be low (affected structures could be repaired, with little, if any, replacement; down-time would be only one or two days).

iii. Cumulative Impacts: Cumulative impacts to offshore structures as a result of the selection of Alternative I, other projects (Section IV.D.), future oil and gas infrastructure, and increased vessel support traffic, will add additional conflicts at the offshore structures. Without the implementation of the present proposal, increases in marine vessel traffic and surface structures will result in more vessel-structure incidents. Increases in marine traffic are expected to occur as a result of future planned projects (see Section IV.D.) and future increases in commercial, military, and private marine traffic. Predicted increases in the sale area include the following (see Table IV.D.4-1): 1) federal leased lands - over 45 exploration wells, over 350 development wells, and over 10 platforms; 2) Proposed State Tidelands Lease Sale between Pt. Conception and Pt. Arguello - 25 exploration wells, 157 development wells, 6 platforms, and one marine tankering facility. The total existing and known future exploration and development activities in state and federal waters offshore Central and Southern California are: over 526 exploration wells, over 1862 development wells, over 59 platforms, over seven artificial islands, and over 21 marine tankering facilities.

The cumulative effect of these increased hydrocarbon activities could result in low impacts to offshore structures in the sale area. Higher impacts would likely occur in the area of greatest hydrocarbon activity (i.e., Santa Barbara Channel). The proposal would add 5 more platforms to the already expected 10 plus platforms in the sale area. Implementation of the proposal is likely to increase the probability of impacts to offshore structures in the sale area, however, the impact level is not likely to be shifted higher. Enactment of the Coast Guard's recommended routing measures (Section III.C.12) would reduce the probability of vessel-structure incidents.

o. Impact on Military Uses

i. Discussion: The military is very active offshore Central California, utilizing approximately 87 percent of the Proposed Sale No. 73 area. The military activities include fleet maneuvers, flight training and testing, missile and bomb testing, submarine transit lanes and diving areas, anti-submarine warfare operations, and dumping grounds. The military agencies involved are the Navy and the Air Force. The military operating areas are the same as were in effect during the preparation of the Sale No. 53 EIS (Bureau of Land Management, 1980a) (Foster, 1982; Abbott, 1982; personal communications) and are illustrated in Visual No. 1 of that document. Offshore oil and gas activities have the potential to impact military operations because of space-use conflicts resulting from increased vessel traffic, the placement of permanent and semi-permanent drilling and production structures, and activities stemming from oil spill cleanup efforts. These impacting agents are discussed below.

Impacting Agents. Most of the current military operations require "exclusive-use" areas with large safety zones or "joint-use" areas with many precautions and extensive scheduling, for hazardous and critical operations. As oil and gas activities are opened up and expanded in Central California, additional space-use conflicts are created with the military.

Vessel Traffic. Offshore oil and gas activities result in extensive traffic of service and support vessels. These include crew and supply boats, and helicopters. Additionally, as oil and gas activities increase, other OCS users such as fishing vessels will also be displaced, adding pressure to use the military operating areas. All these vessels will force the military to increase the surveillance and clearing efforts of an area prior to hazardous military operations. This will create extensive time delays and significantly increase the risk of a major accident where human lives could be lost. Current military operations would have to be reduced or shifted significantly to accommodate this additional OCS usage. The impacts to military activities are expected to be high (significant alterations or reductions of military activities would be required) as a result of this increased vessel traffic.

Structure Placement. The placement of permanent and semi-permanent structures on the OCS is a significant part of oil and gas activities. This would eliminate that part of the OCS from military operations for up to the expected life of the proposal (25 years), forcing the curtailment or shifting of current military operating areas. If alterations were not made, the risk of a life-threatening accident would be greatly increased. The impacts to military activities are expected to be high as a result of the placement of offshore structures, including five permanent platforms ("most likely" case).

Oil Spills. The Oil Spill Risk Analysis Model predicts only one spill as a result of Proposed Sale No. 73. Overall, this is expected to have no impact on military operations. However, if a spill did occur in or near an area used by the military, impacts would be high. This would be the result of heavy traffic in the area of the spill from cleanup efforts, forcing the postponement of operations in the area until the completion of the cleanup efforts (anywhere from several days to many months).

PROPOSED SALE AREA

The military operations in this area include flight training, missile and bomb testing from nearby Vandenberg Air Force Base, dumping sites (see Section IV.E.1.b), and submarine transitting. The expected impacts are high (significant alterations to military activities would be required) as the military operating areas overlap a large amount (approximately 87 percent) with the area being considered for leasing.

AREAS OUTSIDE THE PROPOSED SALE AREA

There will be no impacts expected to military operations outside the sale area (such as the northern portion of the Santa Maria Basin and the Santa Barbara Channel) as a result of the Proposal.

ii. Conclusions: There is substantial overlap between the Proposed Sale area and military operating areas of central California (approximately 87%). This space-use conflict results in high impact levels to military uses (significant alterations or reductions to military operations would be required. The Navy Pacific missile Test Center has specifically identified portions of Warning Area 532 (offshore Vandenberg AFB) as an area of critical importance requiring exclusive-use status. Consultations are currently underway between the Departments of the Interior and Defense. The results of these consultations will be the elimination from leasing considerations of any tracts requiring exclusive-use status, and the invocation of the military stipulations to tracts allowing joint-use status. The stipulations are considered to adequately mitigate any space-use conflicts in the areas for which they are designated.

iii. Cumulative Impacts: The cumulative impacts expected to military activities will remain high (significant alterations to military operations would be required). This is because the existing leases in Central California, located in the Santa Maria Basin, already have the standard military stipulations attached to them, adequately mitigating any impacts to military operations. Impacts from other OCS related activities including expansion of port facilities (such as Pt. Hueneme), increased fishing conflicts, Space Shuttle flights and the MX Missile project at Vandenberg AFB, and the proposed LNG facility at Pt. Conception and future lease sales, are not expected to change the impact level significantly.

F. Alternative II - Modify the Sale to Protect Sensitive Biological Resources in the Morro Bay Area

Alternative II would modify the proposed sale area by deferring from leasing in this proposed sale, three tracts and those portion of four tracts which coincide with a 10-mile zone centered on Morro Bay. Adoption of the alternative would have the effect of assuring that no leasing, and consequently no exploration and development activities would occur as a result of this proposal in 10 mile zone centered on Morro Bay (Figure II.A.2-1).

If this Alternative is selected, expected impacts on the Physical, Biological and Socioeconomic Environment would essentially remain the same as those impacts identified with the proposal, i.e., low or very low. Although there is a slight reduction in acreage, no change is assumed for the resources or the development and transportation scenario. Thus, one spill is expected through the adoption of Alternative II. This oil spill is not expected to contact land near Morro Bay.

All off the impacts described for the Proposal remain the same, with the exception of the following differiences. All impacts would be eliminaated in the vacinity of the Alternative tracts, from activities orginating within them.

Eliminating tracts through selection of this Alternative would afford protection for these resources by 1) allowing additional time for cleanup, containment and weathering should an OCS platform spill occur, and 2) ensuring visual impacts would not exceed a low level due to platform placement. These points are discussed fully in Section II.A.2.

1. Physical Environment

Water Quality. If this Alternative is selected local impacts from routine discharges will be eliminated in the 7 full and partial tracts of the Alternative. Discharges of muds, cuttings, or formation water from outside the area of the Alternative that could reach the area of this Alternative would be diluted to ambient or near ambient levels of trace metals or hydrocarbons. Moderate local water quality impacts would still be expected from the one spill predicted if it should occur in or migrate into the area.

Air Quality. As previously discussed, the elimination of a potential platform in the area of this Alternative will lower the increase in onshore air pollutant concentrations in San Luis Obispo County from that expected from the Proposal. Maximum onshore conentrations of NO_X, SO_2, CO, and TSP would be reduced from the Proposal. Although not possible to quantify, O_3 concentrations onshore will be reduced. This is due to removing the closest source (platform), and ensurring that remaining sources are at most 10 miles offshore.

2. Biological Environmental

Intertidal Benthos. If an oil spill occurs and contacts an intertidal area within the vacinity of the Alternative, there would be moderate impacts to the benthos. The selection of this Alternative would reduce these impacts and the impacts sustained if sensitive rocky intertidal beaches, such as those near Point Buchon, are contacted by oil (Table III.B.1-1). This is due to increased time before spilled oil from a potential OCS platform spill contacts land, allowing more cleanup/containment efforts and increased weathering, dispersion and evaporation of oil. This may result in reduced toxicity and quantity of the spilled oil reaching shore. If oil is prevented from reaching an intertidal area, impacts would be eliminated.

Subtidal Benthos. Deletion from leasing of the seven partial and whole tracts which concides with a 10 mile zone centered on Morro Bay would provide more time for oil from a potential OCS platform spill to weather and disperse, or be diverted or contained before is reaches the shallow water benthic communities which exist near Morro Bay (see discussion on Intertidal Benthos above). In addition, the elimination of these tracts will eliminate the possibility of platform placement, dumping of drilling muds and cuttings, and oil spills originating from these deleted tracts. The expected low impacts associated with these activities are eliminated for the tracts removed.

Fish Resources. Although an oil spill is not expected to occur and contact Morro Bay, Morro Bay Pacific herring could sustain a moderate 3-5 year population reduction due to potential oil spills. Other fish resources in the Bay could also sustain impacts. This Alternative would not eliminate these impacts, but it would afford protection to these populations, particularly during favorable weather conditions, by allowing time for weathering, diversion, and clean-up of any oil spilled during exploratory or development drilling and related operations.

Seabirds. The Morro Bay area is used extensively by local and migrating birds for habitat and food sources. Morro Bay is part of the Pacific Flyway, the migratory pathway that myriads of waterfowl, shorebirds and other water-associated birds follow from their northern breeding grounds to the their wintering grounds. The birds utilizing Morro Bay and the adjacent coastal habitats include the following protected species: American peregrine falcon, California brown pelican, California least tern, California clapper rail, California black rail, and non-protected species such as herons, egrets, black brants and many other waterfowl and wading birds.

Impacts to species in this area were estimated to be very low under Alternative I, since no oil spills were expected to occur and contact land. However, should a spill enter the estuary, impacts could be moderate to high requiring 1 to 2 decades for recovery of the species and their habitat.

Selecting this Alternative would reduce the potential impacts from OCS platform-related spills due to increased time before contact (see Intertidal Benthos above for more details). If an oil spill can be prevented from reaching the estuary and other bird habitat, impacts to this area would be eliminated.

Endangered and Threatened Species. Southern sea otter, California brown pelican, American peregrine falcon, salt marsh harvest mouse and Morro Bay kangaroo rat utilize the Morro Bay area and nearby coastal habitats. Under the proposal, none of these species are expected to experience significant impacts since oil spills are not expected to occur and contact any significant habitat.

However, in the event a spill reaches the area between Point Estero and Pt. Buchon or enters Morro Bay, the most likely impacts to the species or California populations would be as follows: southern sea otter - high; brown pelican - low; peregrine falcon - low; salt marsh harvest mouse - moderate or high. Low impacts would likely mean mortality to a few percent of the species or California population with recovery requiring a few years. Moderate to high impacts would require several decades for recovery.

Selecting this Alternative would reduce the impacts from OCS platform related spills due to increased time before contact. Also, if oil can be prevented from entering the area by booming, containment or dispersants, these impacts could be reduced to insignificant.

Estuaries and Wetlands. In the event an oil spill occurs and contacts Morro Bay, high to very high impacts could result. If a large spill covers the surface of the tidal mud flats and remains for several days, significant interference with the ecological relationship (feeding and breeding grounds) lasting over 10 years could result. Some species within the estuaries, if endemic, may be permanently eliminated. With the adoption of the Alternative, the likelihood of potential high impacts from oil spill resulting from the proposal contacting Morro Bay would be reduced (see Appendix A for impact definitions).

If oil can be prevented from entering the area by booming, containment or dispersants, these impacts could be reduced to insignificant. See Intertidal Benthos for a discussion of the reduction of potential impacts of oil spills with the adoption of this Alternative.

3. Socioeconomic Environment

Commercial Fisheries. Although unlikely, Morro Bay oyster mariculture operations and Cayucos mariculture operations could each sustain moderate economic losses for about one month. Also, although unlikely, Morro Bay fishermen could sustain very high economic losses during the period oil hits shore due to port closure, closure, if a large oil spill occurred and came to shore at this port. This alternative would not eliminate these impacts but it would afford protection to these fishermen, particularly during favorable weather conditions, by allowing additional time for weathering, diversion or clean-up of any oil spilled during exploratory or development drilling and related operations. Overall expected impacts will not change with the adoption of this Alternative.

Sportfishing. The selection of this Alternative would locally reduce the possible impacts to Morro Bay sportfishing activities. This is due to the decreased likelihood of an oil spill impacting the harbor area, and the accompanying closure of the bay. The increased time available prior to oil spill contact would assist clean-up and containment activities, and decrease the potential toxicity of the oil by allowing more time for weathering and dispersion to occur.

Recreation and Tourism. This Alternative would locally reduce or eliminate the potential for oil and gas activities to impact the visual and aesthetic resources of Morro Bay, both of which contribute to recreational enjoyment and the attraction of tourists to the area. This would be due to the elimination of any offshore platforms and related activities being located immediately adjacent to the Morro Bay coastline. Oil and gas stuctures may be considered visually degrading by coastal residents, and tourists as well. Those tourists seeking a uncluttered, pristine view of the Pacific ocean may not be attracted back to Morro Bay for future vacations if development occurred. The presently pristine view offshore of Morro Bay would be protected by this Alternative. Additionally, the potential for oil spills impacting any of Morro Bay's important recreation or tourist areas would be reduced since the origin of platform-related oil spills would be more distant from these areas. The increased distance the spill would have to travel to reach Morro Bay would create additional time for oil spill clean-up and containment efforts, and allow additional weathering and dispersion of the spilled oil. Overall, impacts to the recreation and tourist activities in Morro Bay from the adoption of this Alternative would be reduced from low to very low.

Visual Resources. The impacts from offshore platforms on Visual Resources off Morro Bay were based on the Granville Corporation Study (1981). The impact levels were determined by the expected change in the aesthetic resources of the area based on OCS development. Impacts from platforms three miles offshore to visual resources of the Morro Bay area would be low. With the selection of this alternative, platforms would not be constructed within the Alternative area. Localized visual resources impacts would be reduced or eliminated through the adoption of this Alternative.

If an oil spill contacts the shoreline, an additional degradation to the visual quality of the bay would occur. This degradation would remain until cleanup operations are accomplished by either man or natural processes. If a spill contacted Morro Bay, a high impact would be expected. With the selection of this alternative, the likelihood of a spill from the proposal contacting the bay would be reduced.

Cultural Resources. Deletion of the nearshore Morro Bay tracts would remove approximately 23,000 acres (less than 1% of the proposed lease sale area) from possible impacts to known and as yet unidentified cultural resources in the Morro Bay area (i.e., shipwrecks). Three of the tracts have already been listed for invocation of the cultural resource stipulation due to reported historic shipwrecks in the area. This Alternative would eliminate the impacts to these sites.

Ports and Harbors. The potential impacts will be slightly reduced to Morro Bay as more time is afforded for oil spill clean-up, diversion and weathering, evaporation, and dispersion of oil in the event of a platform spill before contact with shore.

G. Alternative III - Modify the Sale to Protect Sensitive Resources in the Central San Luis Obispo County Coastal Area

Alternative III would modify the proposed sale by deferring from leasing 29 tracts located offshore the central portion of the San Luis Obispo County coast (see Figure III.A.3-1). Adoption of this alternative would assure that no leasing, and consequently no exploration and development activities would occur in these 29 tracts.

The environmental impacts described for this alternative assume that leasing, exploration, or development will not occur on the 29 tracts in this alternative. The area within this alternative represents approximately 158,000 acres (63,000 hectares) or 8 percent of the area within the proposed sale area boundary. With the adoption of Alternative III, the Most Likely Resource Estimate of the total undiscovered recoverable oil and gas which would remain in the proposed sale area would be reduced to 210 million barrels of oil and 210 billion cubic feet of gas (Table II.A.3-1). This represents a decrease of 28% for oil resources, and a decrease of 26% for gas resources. The number of platforms required to develop the remaining resources are estimated to be four. This represents a decrease of 20%, as the Proposal is estimated to require five platforms. The offshore intrastructure required to develop the remaining resources is presented in Table II.A.3-1.

The number of large oil spills ($\geq$1,000 bbls) estimated to occur as a result of selection of this alternative remains one, as for the Proposal. The number of very large oil spills ($\geq$10,000 bbls) statistically expected with a 25% or greater chance of occuring decreases from one (for the Proposal) to none for this alternative. The number of spills estimated to occur and contact the various resource targets showed some decrease when compared to the Proposal. The sea otter range showed no expected spill contacts, as for the Proposal. The potential risk of an oil spill is, however, further reduced, as the sea otter range is adjacent to the tracts included in this Alternative. The Channel Islands Marine Sanctuary (northern islands) showed a decrease from one expected spill occurrence and contact to no expected spills occurence and contact. This would reduce any significant impacts to the resources of the sanctuary, such as fish, seabirds, and marine mammals. The individual land segments showed no expected spill occurrence and contact, as for the Proposal. Though no spill contacts were expected, land segments #25 (Port San Luis area) and #39 (northern side of San Miguel Island) again showed the highest potential for spill contact. This potential is, however, reduced with the selection of this alternative.

All of the impacts described for the proposal remain the same, with the exception of the following differences. All of the impacts would be eliminated in the immediate vicinity of the 29 tracts deferred, from activities originating within the alternative area, if selected. These impacts result from platform placement, potential oil spills, increased vessel traffic, and related support activities.

The main advantages of selection of this alternative are enumerated in Section II.a.3.

1. Physical Environment

Water Quality. If this Alternative is selected the impacts to water quality would be slightly lower on a regional basis than as described for the Proposal (Alternative I) due to the elimination of one platform predicted in the Alternative area. The volumes of materials discharged from routine operations would decrease by about 100,000 barrels of mud, 70,000 barrels of cuttings, 22,000,000 barrels of formation water, and 3,800 gallons per day of sewage. Thus, the impacts to water quality would be slightly lower on a regional basis but still described as very low.

The impacts to water quality on a local basis would be as described in the Proposal (Alternative I); moderate (within 300 meters of discharge), low (within 1,000 meters of discharge point), and very low (outside 1,000 meters). However, local impacts to water quality will be almost eliminated in the 29 tracts off San Luis Obispo County if this Alternative is selected. Local impacts would be eliminated because there would be no routine discharges on these tracts and pollutants from muds, cuttings, or formation water, from activities outside the area of this Alternative that could reach the area of this Alternative, would be diluted to ambient on near ambient levels of trace metals and hydrocarbons. Moderate local water quality impacts could still occur from the expected one spill should it occur in the area or move with currents into the area.

Air Quality. The elimination of one platform will lower the increase in onshore air pollutant concentrations in San Luis Obispo County from that expected from the Proposal. Maximum onshore concentrations of NO_X, SO_2, CO, and TSP would be reduced from the Proposal. Although not possible to quantify, O_3 concentrations onshore will be reduced. This is due to removing the closest source (platform), and ensuring that remaining sources are at most 12 miles offshore.

2. Biological Environment

Intertidal Benthos. Adoption of this Alternative will not change the expected impacts on the intertidal communities within the proposed sale area. No large oil spills are expected to occur and contact intertidal areas from the Proposal, however, if an oil spill did occur and contact sensitive rocky intertidal areas such as those just north of Point Buchon to Point San Luis (Table III.B.1-1) moderate impacts would occur. These potential impacts will be reduced with this Alternative by allowing additional time for clean-up operations and further evaporation, dispersion, and break-up of any oil spilled from OCS platforms.

Subtidal Benthos. Adoption of this Alternative would remove the possibility of any platforms from being placed in the Alternative area. One platform was predicted for this area, resulting in high impacts within 100 meters of the platforms and low impacts from 100 to 1,000 meters from the platform from the dumping of drilling muds and cuttings.

No change in impacts from oil spills is expected as no spills are expected to occur and contact shallow water subtidal areas. If an oil spill did occur, and contact subtidal areas, low to moderate impacts are expected to kelpbed-associated organisms in shallow water benthic communities. Selection of this Alternative will reduce the potential impacts of oil spills as more time will be afforded with the placement of platforms further from shore. This additional time will allow increased clean-up efforts, weathering, dispersion, and thereby reduce the quantity and toxicity of any platform spilled oil when it contacts the coast.

Fish Resources. No significant impacts to fish resources from the Proposal are expected. Therefore, adoption of this Alternative would not change expected impacts to fish resources. Although impacts to fish resources from oil are unlikely, oil could contact fish resources. Protection afforded fish resources from this alternative would be minor.

Marine Mammals. Adoption of this alternative would reduce impacts slightly. Noise and disturbance were expected to cause low impacts to harbor seals concentrations near Point Buchon and Point San Luis. Elimination of the platform would decrease boat and aircraft traffic near haul out and pupping areas. Local impacts would be reduced from low to very low. Regional impact levels would remain the same.

Seabirds. Expected regional impacts remain low to moderate with adoption of this Alternative. However, adoption of this Alternative would provide protection for Morro Bay. See Alternative II for a discussion of bird resources. Coastal feeding areas would also receive protection due to increased time for clean-up, containment and weathering.

Endangered Species. This Alternative would provide protection from a potential OCS related oil spill by allowing increased time for clean-up, containment and weathering of oil.

Up to 200 sea otters used the coast between Point San Luis and Point Estero. Fish and Wildlife Service has stated that the "potential for growth is greatest near the ends of the range...Even a relatively small oil spill coupled with other increased man-caused mortality could set back population growth at the southern end of the range..." Although no spills greater than 1000 bbl are estimated to occur and contact the otter range, potential impacts, should a spill occur, could be high to very high (recovery requiring one to several decades).

Small oil spills (<1000 bbls) could also slightly increased sea otter mortality. Adoption of this Alternative would reduce expected low local impacts due to oil spillage from low to very low due to removal of small sources such as boats and exploration activities.

In addition the area is a feeding ground for brown pelicans. Peregrine falcons nest at Pismo Beach. Impacts, in the unlikely event of an oil spill would be low.

Boat and aircraft traffic is also expected to cause disturbance and possibly very low mortality to sea otters. This Alternative would reduce these expected impacts to the sea otters from low to very low.

In conclusion, this Alternative will provide a protection zone for sea otters and other endangered species. Expected local impacts would be reduced from low to very low.

Estuaries and Wetlands. Adoption of this Alternative will not change the expected impact levels, as none were expected. If oil did enter an estuary, such as San Luis Creek, high impacts could be sustained. The entrance to this creek is less than 100 meters (Table IV.E.2.g) making it very feasible to boom the entrance, depending on weather and tidal conditions. It is estimated, however, that oil could enter if spilled from 28-35% of the time (depending on season and weather conditions). The selection of this Alternative will allow additional time before oil contacts shore should a platform spill occur, as the spill source will be further offshore. This will reduce potential oil spill impacts by allowing more time for clean-up efforts and the weathering, evaporation, and dispersion of the spilled oil. This will reduce the quantity and toxicity of any oil reaching shore.

3. Socioeconomic Environment

Coastal Economy. The increase to the coastal economy expected from the Proposal will be reduced by 20% for permanent jobs, and by 17% in earnings, with this alternative. The population increase expected from the Proposal will be reduced by 12% with the selection of this Alternative. The net increase with the selection of this Alternative is approximately 387 permanent jobs, and an increase in earnings of approximately $75 million dollars.

Demography. This Alternative is expected to result in an increase in population of 640 people, or 87.8% of the increase expected with the Proposal.

Commercial Fisheries. Adoption of this Alternative would significantly reduce the localized expected impacts to trawl fishermen who fish in the Alternative area. This Alternative would remove 27 tracts that overlap commercial trawl grounds, including 10 that overlap an important shrimp trawl area. In 1981, roughly half of all fishing effort in the proposed sale area for the Pacific Ocean shrimp occurred in these tracts.

In 1981, the value of the Pacific Ocean (pink) shrimp fishery to the proposed sale area (using a multiplier of 3.1) was $1.7 million. The proposal is expected to result in: 1) moderate (10-20%) economic losses for at least 3 years to trawl fishermen who fish the Alternative area, due to pipelaying activities, 2) low (less than 10%) economic losses during years of peak activity to trawl fishermen who fish the Alternative area, due to loss of space and navigation hazards. Adoption of this Alternative would reduce or eliminate oil spills, manmade structures and vessel traffic in the Alternative area. Therefore, adoption of this Alternative would reduce economic losses to commercial trawl fishermen who fish the Alternative area to an insignificant level.

Concerns raised by the California Coastal Commission regarding fisheries are relevant to this Alternative area. See response to Comment No. 15c.10 in Section V.

Impacts to commercial fishermen in the remaining proposed sale area would remain as described in Section IV.E.3.e.

Although this Alternative is expected to significantly reduce expected impacts to trawl fishermen who fish the Alternative area, it is important to note that commercial fisheries is cyclical and varies considerably from year to year, and areas that are prime fishing areas now may not be prime fishing areas in the future.

Sportfishing. Selection of this Alternative would slightly reduce the likelihood of an oil spill impacting local sportfishing activities between Morro Bay and Port San Luis. The absence of platforms and exploratory vessels in the Alternative area eliminates potential space-use conflicts, but also eliminates the benefits to sportfishermen created by "artificial reefs." Although the impacts to sportfishing would be reduced, there would be no change from the low expected impact level.

Recreation and Tourism. Selection of this Alternative will reduce from low to very low, impacts to the area between Morro Bay and Port San Luis. This reduction would be due to the elimination of potential vessel traffic conflicts with recreational boaters, visual degradation of the coastline with offshore platforms and exploratory vessels, and the potential for an oil spill to impact important recreation and tourist areas.

Visual Resources. If this Alternative is selected the visual resources of this area will remain unaltered by oil and gas operations. This is a reduction from the Proposal which could result in visual intrusion by offshore platforms and drilling vessels. This Alternative will reduce the local impacts from low to very low.

Cultural Resources. Deletion of these 29 tracts will eliminate any possible impacts to shipwrecks from bottom disturbing activities within the 29 tracts. One of these tracts has been listed for invocation of the cultural resource stipulation due to a known historic shipwreck. This Alternative would protect any other shipwrecks which may be in the area. Locally, the very low expected impacts will be eliminated.

Ports and Harbors, Marine Traffic, Offshore Structures. Impacts to ports and harbors, marine traffic, and offshore structures will be slightly reduced due to the elimination of one platform, the number of exploration wells, and the accompanying support activity and tanker trips.

H. Alternative IV - Modify the Sale to Protect Sensitive Areas

Alternative IV would modify the sale by eliminating 15 tracts located between Point San Luis and Purisma Point (see Figure II.A.4-1). This area represents approximately 62,200 acres (25,000 hectares) or 3 percent of the area within the proposed sale area boundary. Adoption of the alternative would have the effect of assuring that no leasing, and consequently no exploration and development activities would occur as a result of this proposal.

With the adoption of Alternative IV, the Most Likely Resource Estimate of the total undiscovered recoverable oil and gas which would remain in the proposed sale area after the tracts are deferred would be 280 million barrels of oil and 280 billion cubic feet of gas (Table II.A.4-1). This represents a decrease of only 3% of the estimated oil resources, and no decrease in the estimated gas resources or number of platforms required to develop these resources.

The number of large and very large oil spills estimated to occur as a result of this alternative are each one - no change from the Proposal. This is due to the very small change in the amount of oil estimated. The oil spill model results show virtually no change in expected spill occurrences and contacts for the sea otter range, the Channel Islands Marine Sanctuary, or any of the land segments. The potential risk is, however, reduced as these nearshore tracts lie close to a large portion of the sea otter range and the coastal resources

All of the impacts described for the Proposal remain the same, with the exception of the following differences. All the impacts would be eliminated in the immediate vicinity of the Alternative tracts, from activities originating within them. The main advantages of selection of this alternative are discussed in Section II.A.4.

1. Physical Environment

Water Quality. This Alternative if selected would have almost no effect on the level of impacts to water quality of the overall area, because the volumes of materials expected to be discharged would remain almost as described for the proposal (Alternative I). The local impact from routine discharges will be eliminated in the tracts of this Alternative if this Alternative is selected. Discharge of muds, cuttings, or formation water from outside the area of this Alternative that reach the area of this Alternative would be diluted to ambient or near ambient levels of trace metals or hydrocarbons. Moderate local water quality impacts wouuld still be expected from the one spill predicted if it should occur in or migrate into the area.

Air Quality. The elimination of a possible platform within the area of this Alternative will lower the incrase in onshore air pollutant concentrations in San Luis Obispo County from that expected from the Proposal. Maximum onshore concentration of NO_X, SO_2, CO, and TSP would be reduced from the Proposal. Although not possible to quantify, O_3 concentration onshore will be reduced. This is due to removing the closest source (platform), and ensuring that remaining sources are at most 12 miles offshore.

2. Biological Environment

Intertidal Benthos. Adoption of this Alternative will not change the expected impacts from the Proposal to intertidal communities within the proposed sale. In the event of a oil spill moving directly to shore, this Alternative will allow for more time for oil to weather or be diverted before it reaches the sensitive rocky intertidal areas such as Pirate's Cove, around Avila, Mussel Point to Point Sal, Packard Point to Purisima Point (Table III.B.1-1) and the rich Pismo Clam areas at Pismo Beach. This additional time would reduce the potential impacts (should a spill occur and contact) of moderate to the rocky intertidal areas, and high to Pismo Beach (during certain times of the year).

Fish Resources. Although an oil spill is unlikely to occur and contact the San Luis Obispo Creek area, the San Luis Obispo Creek Pacific herring population could sustain a moderate 3-5 year population reduction due to oil spills. This Alternative would afford protection to this population, particularly during favorable weather conditions, by allowing time for weathering, diversion or clean-up of any oil spilled during exploratory or development drilling and related operations. Impacts to fish resources in the remaining proposed sale area would remain as described in Section IV.E.2.c.

Seabirds. Adoption of this Alternative would provide protection for coastal feeding areas due to increased time for clean-up, containment and weathering.

Endangered Species. This Alternative would provide protection from a potential OCS related oil spill by allowing increased time for clean-up, containment and weathering of oil.

Although the number of sea otters counted south of Point San Luis is usually less than 100 animals, Fish and Wildlife Service has stated that the "potential for growth is greatest near the ends of the range...Even a relatively small oil spill coupled with other increased man-caused mortality could set back population growth at the southern end of the range..." Although no oil spills greater than 1000 bbl are estimated to occur and contact the otter range, potential impacts, should a spill occur, could be high to very high (recovery requiring 1 to several decades).

Small oil spills could also slightly increase sea otter mortality. Adoption of this Alternative would reduce expected local impacts due to oil spillage from low to very low due to removal of small sources such as boats and exploration drilling activities.

In addition the area is a feeding ground for brown pelicans. Peregrine falcons nest at Pismo Beach. Least terns, nest at the Santa Maria River. Impacts, in the unlikely event of an oil spill would be low (recovery requiring 1 to 2 years).

Boat and aircraft traffic is also expected to cause disturbance and possibly very low mortality to sea otters. This Alternative would reduce these expected impacts to the sea otters from low to very low.

In conclusion, this Alternative will provide a protection zone for sea otters and other endangered species. Expected local impacts would be reduced from low to very low.

Estuaries and Wetlands. In the unlikely event an oil spill moves directly to shore, this Alternative will allow more time for oil to weather or be diverted before it reaches the Santa Maria River estuary. Although Santa Maria River is open to the sea only intermittently, it is open during the winter when waves are largest and diversion of oil near its mouth is less effective than any other time of the year. Diversion or containment of an oil spill could prevent a high impact (see Appendix A for definitions of impacts) to this estuary. The adoption of this Alternative will reduce the potential of an oil spill entering the Santa Maria River Esturies.

3. Socioeconomic Environment

Commercial Fisheries. Adoption of this Alternative would significantly reduce the expected impacts to trawl and set gear fisherman who fish in the Alternative area.

This Alternative would remove 14 tracts that overlap commercial trawl grounds for California halibut. Between 8/81 and 1/82, 15-20 percent of all fishing effort in the proposed sale area for groundfish (rockfish, California halibut, petrale sole, lingcod, English sole, rex sole, Dover sole) occurred in these tracts. Most of this effort apparently was for halibut.

In 1981, the value of the California halibut fishery to the proposed sale area (using a multiplier of 3.1) was $1.1 million. About 40% of this halibut was taken by trawl. The Proposal is expected to result in: 1) moderate (10-20%) economic losses for at least 3 years to trawl fishermen who fish the Alternative area due to pipelaying activities; and 2) low (less than 10%) economic losses during years of peak activity to trawl fishermen who fish the Alternative area due to loss of space and navigation hazards. Adoption of this Alternative would reduce or eliminate oil spills, manmade structures and vessel traffic in the Alternative area. Therefore, adoption of this Alternative would reduce to low economic losses to insignificant for commercial trawl fishermen who fish the Alternative area.

Concern raised by the California Coastal Commission regarding fisheries are relevant to this Alternative area. See response to comment No. 15c.10 in Section V.

Another fishery concern in the Alternative area is set gear fishing. Two main types of set gear are used in the Alternative area between Point San Luis and Point Sal: 1) traps to catch rock crabs inside 55 meters (180 ft, 30 fm); and 2) trammel nets to catch California halibut from 6-46 meters (18-150 ft, 3-25 fm). In 1981, the value of the rock crab fishery to the proposed sale area (using a multiplier of 3.1) was $0.4 million. As discussed above, the value of the California halibut fishery was $1.1 million. About 60% of this halibut was taken by trammel nets. The Proposal is expected to result in low (less than 10%) economic losses during years of peak activity to set gear fishermen who fish the Alternative area, due to navigation hazards and gear loss from vessel traffic. Adoption of this Alternative would reduce or eliminate oil spills, manmade structures, and vessel traffic in the Alternative area. Therefore, adoption of this Alternative would reduce economic losses to set gear fishermen who fish in the Alternative area to an insignificant level.

However, adoption of this Alternative would not change the potential impacts to commercial fisheries from oil spills. Fishermen who fish the Port San Luis Bay area still could sustain moderate economic losses for one month due to oil contamination of fishing gear and vessels, and Port San Luis (Avila) fishermen could sustain very high economic losses during the period oil hits shore due to port closure, if a large oil spill occurred and came to shore at this port. However, this Alternative would afford protection to these fishermen, particularly during favorable weather conditions, by allowing time for weathering, diversion or clean-up of any oil spilled during exploratory or development drilling and related operations.

Although this Alternative is expected to significantly reduce expected economic impacts to trawl fishermen who fish the Alternative area, it is important to note that commercial fisheries is cyclical and varies considerably from year to year, and areas that are prime fishing areas now may not be prime fishing areas in the future.

Impacts to commercial fishermen in the remaining proposed sale area would remain as described in Section IV.E.3.e.

Sportfishing. The area proposed for deletion from the lease sale by Alternative IV includes tracts off Pismo Beach, an important sportfishing and clamming area. The Pismo Beach clam reserve is also located adjacent to these tracts. Selection of Alternative IV would locally reduce potential impacts to sportfishing in this area from low to very low. The potential for an oil spill impacting the beach (used by sportfishermen) and port facilities at San Luis would be locally reduced for the reasons given in the preceeding discussion on commercial fishing.

Recreation. Recreational activities in the area proposed for deletion by this Alternative include sportfishing, boating, picnicking and sightseeing. Pismo Beach is a heavily used area by recreationists. The Alternative would reduce the potential for a major oil spill impacting major recreation areas, most of which are associated with the local beaches. With this Alternative, scenic quality of the area would remain unchanged, and vessel activities offshore would be much reduced, thereby avoiding most conflicts between recreational boaters and oil and gas support vessels. Selection of Alternative IV would locally reduce impacts to the Port San Luis to Purisma Point area from low to very low.

Tourism. Tourism is directly affected by the availability of recreational opportunities and the quality of visual resources. In the area proposed for deletion from leasing by Alternative IV, sportfishing is also very important. Selection of this Alternative would reduce the potential for these resources to be adversely impacted in the event of a major oil spill. Degradation of visual resources would also be prevented since offshore structures would not be immediately visible. Since many tourists are presently attracted to this area because of its scenic quality and recreational opportunities, and the potential for altering these resources by oil and gas development would be removed, adoption of this Alternative would locally (in the Pismo Beach area) reduce the potential impacts to tourism expected from the Proposal, from low to very low.

Visual Resources. The deletion of the nearshore tracts off Pismo Beach, as proposed by Alternative IV, would eliminate the visual degradation possible from offshore structures, further the already low risks of a major oil spill impacting major recreation and tourist attractions would be reduced.

Cultural Resources. Deletion of the 15 tracts will remove these tracts from any bottom disturbing activities originating in this area. Seven of these tracts have been listed for invocation of the cultural resource stipulation due to known historic shipwrecks. Except possible disturbances from pipelines placement which may still cross this area the selection of this Alternative would eliminate potential impacts to these historic shipwrecks and any other shipwrecks which may be in this area.

Ports and Harbors, Marine Traffic, Offshore Structures. Impacts to ports and harbors, marine traffic, and offshore structures will be slightly reduced due to the reduction in the oil resources, exploratory wells, support vessel trips and tanker trips. This in turn reduces the potential accidents between vessels, vessels and offshore structures, and port congestion. This Alternative will reduce potential impacts in Alternative area.

I. Environmental Impacts of Alternative V - Delay the Sale

The impact of the Delay the Sale Alternative would be the postponement of the impacts described in Section IV.E. until such time as the sale is reinstated. Refer to Section II.A.5 for a complete description of this alternative.

Postponement of the Proposed Sale No. 73 would result in delay in the exploration, development, and production of oil and gas resources. Any economic or national security benefits which could be attributed to the domestic production of hydrocarbons in these amounts would be postponed.

Any of those impacts which could result from the proposal would not occur until the proposal is reinstated. During the delay period improvements may occur in technologies for oil spill prevention and recovery, deepwater drilling and production techniques for oil spill prevention and recovery, deepwater drilling and production techniques, or for exploration and production in hostile environments which may lessen the risk of some adverse impacts. The actual degree of improvements depends on the time frame of the delay. Also, new information on oil and gas resources may become available from drilling on adjacent existing leases and the economic feasibility of developing an area will probably improve.

Other reasons for delaying Proposed Sale No. 73 could be to allow for the resolution of existing conflicts and to obtain additional information from within the proposed sale area. Additional information from ongoing or future studies could enhance the knowledge of the environment and assist in the assessment of the potential effects of OCS activities.

J. Alternative VI - No Sale

This alternative removes the total area for proposed leasing at this time. All potential physical, biological, and socioeconomic impacts resulting from hydrocarbon exploration and development from Proposed Sale No. 73 would be eliminated at this time.

Although cancelling Proposed Sale No. 73 would eliminate all the impacts that are expected as a result of the proposal, impacts within the region would still result from existing oil and gas activities from the previous OCS Sale No. 53, the State Tidelands leasing and development (refer to Sections IV.C.3 and D.4) and future OCS Lease Sales in this area, as well as, the importation of oil via tankers to refineries in the area (see Section III.C.13).

Changes to the Physical, Biological and Socioeconomic resources over the next 25 years without the proposal, would still occur. Population expansion and associated impacts will continue, and would be directly or indirectly responsible for most problems and benefits associated with non-oil related changes in Central California. The future environment without the proposal is presented on the following pages.

1. Physical Environment

Water Quality. Water quality will still continue to degrade in several bays and estuaries due primarily to agricultural runoff. San Francisco and Morro Bays may experience decreased water quality due to industrial, power plant, or domestic sewage effluents which will increase with increasing populations. Those water quality decreases may be balanced in part by improved secondary sewage treatment required by the EPA. Contributions of trace metals (e.g., lead) to the ocean near major urban areas will continue due to automobile and industrial combustion of fossil fuels and subsequent aerial washout.

Dump Sites. New dump sites will be designated as their need arises, and positioning of these sites will be in areas of least potential environmental impact. Deterioration of the water quality will occur temporarily and locally at each of the dump sites; however, overall there will be minor changes. The impacts from the dump sites are expected to remain at present levels.

Air Quality. Without the proposed project air quality would not change significantly from present conditions. Some increase in air emissions may be expected as a result of population growth and associated increases in vehicular traffic. Onshore emission sources are regulated by the local air pollution control districts and no new emission sources would be permitted that would cause exceedance of the air quality standards. Furthermore, in areas that are classified nonattainment, new emission sources would be required to acquire offsets so that no net increase in emission would result. Counties must submit air quality attainment plans designed to meet ambient standards by 1987 according to the Clean Air Act laws.

Offshore oil and gas developments from past OCS lease sales and future leases in State tideland waters will result in increased air emissions. These increases will not be large; however, the potential exists for increased ozone levels from Lease Sale 53 activities (DOI, 1980). OCS sources are regulated by DOI and will be controlled to the extent necessary to prevent violations of the standards (see Appendix H). Associated onshore facilities (oil and gas processing facilities, marine terminals, transportation systems) will also result in increased onshore emissions. These facilities will be subject to regulation by local air pollution control agencies. In some cases, emission offsets may be required which may affect the growth of certain existing industries.

2. Biological Environment

Intertidal Benthos. With the expected population expansion and development along the coast of Central California, some corresponding impact to the intertidal environment is expected. Although the rate of degradation will be decreased due to Federal, State and local commitments and legal mandates, the amount is nonquantifiable and unpredictable except in general terms.

Increased visitor use of intertidal areas for food gathering or walking, collecting, overturning rocks, etc., will have detrimental effects on certain areas where use is highest. Municipal sewage near coastal cities or oil spills from tankering from Alaska and foreign sources, particularly near San Francisco, will cause additional impacts to certain areas.

In the proposed sale area, impacts could result from previously leased OCS sales (particularly Sale No. 53), State of California leases in State Tidelands, Pt. Conception LNG accidents (if the plant is constructed), sewage facilities resulting from the expansion of Vandenberg Air Force Base or other cities in the area.

Further impacts are possible from import oil tanker accidents, previous OCS sales and State of California Tideland leases. Within the proposed sale area, impacts should be locally very low to low.

Subtidal Benthos. The principal non-oil effects to the subtidal benthos will come from pollution and waste disposal. Most of these impacts will be localized near cities. Although the magnitudes of the impacts are difficult to predict, impacts within the proposed sale area should be locally low to moderate.

Fish Resources. Without the proposal, fish populations are expected to decrease due to fishing pressure, sewage disposal, natural oil seeps, existing and proposed offshore oil and gas leases (State and Federal), tanker transportion of foreign and Alaskan crude oil imports, and other vessel traffic (see Sections I.C, III.C.5, III.C.6, III.C.12, IV.A.4, IV.C.3, and IV.D for descriptions of these actions).

Fishing pressure probably is the most important stress on fish resources. Large to very large amounts of fish are taken by commercial and sportfishermen (see Sections III.C.5 and III.C.6). Oil spills could also be an important stress, particularly when added to oil from sewage disposal and natural oil seeps. Oil from all of these sources is expected to cause a moderate reduction in salmon populations lasting 5 years or more, a moderate reduction in Pacific herring populations lasting 3-5 years, and a small 1-2 year reduction in northern anchovy and squid populations. Manmade structures, effluents and discharges, and noise are expected to cause very little, if any, decrease in fish populations (see Section IV.E.2.c).

The cumulative effect of all of these stresses on fish populations, particularly fishing pressure, is expected to cause large to very large decreases in fish populations.

Marine Mammals. Marine mammals (pinniped and small cetaceans) will suffer impacts from several sources over the next 25 years. Sewage, increased tanker and recreational traffic, existing future hydrocarbon leases, expanding population centers along the coast, changing climatic conditions and other natural causes may change marine mammal distributions.

Without the proposal, some species are expected to suffer moderate to high reductions in local populations. Some species may suffer a general degradation in health due to pollutants. Overall, population numbers are expected to increase or remain the same; however, general levels of health may be slightly reduced.

Seabirds. Without the proposal, seabirds will suffer impacts from several sources over the next 25 years. Sewage, increased tanker and recreational traffic, existing leases (State and Federal), expanding population centers along the coast and changing climate conditions may reduce seabird distribution and populations. However, with increased conservation efforts it is possible many of these effects can be reduced.

If pollution levels remain constant or increase, some species may suffer low level impacts from several sources and a general degradation of health is possible. Overall, the impacts are expected to be low to moderate; that is, some individuals may die but most species are expected to maintain viable populations.

Endangered and Threatened Species. Without the proposal, Endangered Species will suffer impacts from several sources over the next 25 years. Sewage disposal, increased tanker and recreational traffic, expanding population centers along the coast, changing climatic conditions or other natural changes, and impacts from existing OCS leases may cause changes in species abundance and distributions. Some species such as brown pelicans, least terns, peregrin falcons and bald eagles seem to be recovering. Their biology is reasonably well understood and it is expected recovery should continue. Other species such as the rails are secretive animals and little of their habitat remains. Their future is much more tenuous. The survival of northern right whale and southern sea otter is also in question. Oil spills are always a serious threat to the sea otters. Overall it is expected some species will increase in numbers and distribution. Others, such as northern right whale may face extinction over the next 25 years.

Estuaries and Wetlands. With the predicted population expansion and development near wetlands, some corresponding degradation to these areas is expected. Although the rate of degradation will be decreased due to Federal, State and local commitments and legal mandates, the amount is difficult to predict except in general terms.

If the no sale alternative is chosen, oil related impacts to estuaries and wetlands could come from oil import tanker accidents, particularly in the Bodega Basin near San Francisco. In Santa Maria Basin further impacts could come from OCS Sale No. 53 and State of California Tideland leases. The estuaries most sensitive to these activities are Morro Bay and the San Luis Obispo Creek. However, since no large oil spills are expected to occur and contact these estuaries, impacts to these estuaries should remain very low; however, within estuaries, localized low to moderate impacts could occur.

Areas of Special Concern. The above discussion of intertidal benthos can be applied here since most of the Sensitive Biological Areas are intertidal areas. Whether these protected areas will be degraded or upgraded in the future will primarily depend upon the quantity and quality of domestic pollution, enforcement and prevention of intertidal collecting, and reduction of the amount of human traffic allowed on the sensitive areas.

The largest impact from tanker import spills, previous OCS or future State oil activity will depend upon the number, quantity and frequency of spills reaching the sensitive areas. According to the oil spill model, no spills are expected to occur and contact a sensitive area within the proposed sale area.

Pt. Reyes/Marine Sanctuaries. If the No Sale Alternative is chosen, parts of the Point Reyes/Farallon Island Marine Sanctuary will be affected from pollution contained in the outflow of San Francisco Bay. Both the sanctuary and Point Reyes Seashore could be impacted by import oil tanker accidents.

Oil spills resulting from tanker accidents, previous OCS or State Tidelands lease sales have a high probability of occurring and contacting the Channel Islands National Marine Sanctuary in Southern Califiornia (BLM, 1975 and 1979). Impacts to marine birds and mammals, intertidal and shallow water subtidal benthos will range from low through high from an oil spill. Consult the appropriate sections for discussions of the impacts for the specific biological resources.

3. Socioeconomic Environment

Coastal Economy. Selection of this alternative would eliminate the economic impacts described in Section IV.E.3.b. Realization of the economic and national security benefits expected to result from Proposed Sale No. 73 would be foregone. All regional increases in economic activity expected to occur as a result of the proposal would be eliminated, including expected increases in employment.

Without Proposed Sale No. 73, the study area is still expected to experience a significant increase in the labor force and general economic activity. The labor force in the study area is projected to increase by 48.85 percent during the project period. However, the average increase in the labor force would be 1.00 percent per year of the base. Table IV.J.3-2 shows projected increases in the labor force for Sale Area during the study period.

Total earnings for the sale area are projected to increase by 279.5 percent during the project period. This represents a 3.39 percent gain per year, a moderate economic growth rate for the total sale area. Table IV.H.3-3 shows projected growth of selected economic components for the sale area during the study period.

Demography. Selection of this alternative will result in the removal of all impacts associated with Alternative I. However, the study area is expected to have a large increase in population between 1980 and 2020. Population is expected to increase by 43.72 percent or an annual increase of 0.91 percent. The additional population is expected to result in an increased housing demand, reduced household size, and reduced rate of home ownership. Table IV.J.3-1 presents information on population changes expected between 1980 and 2020.

Public Services and Facilities. Increases in population of Central California, as projected by the State of California, will stress public services and facilities with or without the proposed action. Population growth will continue to stress the existing water supply along the entire coast. Pumping from wells will continue overdrafting the water table which may lead to lowering of the water table, saltwater intrusion, and subsidence. This will result in requiring construction of new facilities, strict conservation measures and major water transportation projects.

Impacts from projected population growth will stress existing waste water treatment facilities, result in more frequent and greater numbers of septic tank failures and create waste residue disposal problems. These impacts may occur at different times along the coast depending upon the status of the existing treatment facilities. Transportation systems are adequate in most areas and can accommodate some increase. Future population growth may stress these systems (roads, airports, railroads) further in the future with road systems being subject to the most stress the earliest. Airports and railroads should be able to accommodate most increases. Power generating facilities are adequate for current and near future needs. Long term population growth may require construction of new plants.

The local, county and State governments are seriously hampered in providing for these future needs due to the effects of Proposition 13. Funds for public services and facility construction or improvement are very limited, Federal funding is also less. Serious impacts to services and facilities may occur sooner than expected because of local governments' inability to deal with the need for improvements or new facilities.

Requirements of the Clean Water Act to end ocean and stream dumping of treated wastes in 1985 will cause further stress on existing systems.

Coastal Land Use. Pressure for changes in land use and in demand for housing will exist in Central California without the proposal. Projected population growth will create a demand for more intensive urban land use. Commercial and industrial growth will create a demands for rezoning of existing land use. The demand and need for affordable housing will continue. Overall all types of housing will continue to be in demand from the increasing population. Local jurisdictions will have to deal with growth induced demands through Local Coastal Programs, Port Master Plans, and City and County General Plans.

Commercial Fisheries. Without the proposal, commercial fishermen are expected to sustain economic losses due to natural fluctuations in fish and shellfish populations, competition with foreign fishermen, changes in market conditions, restrictions on fish harvests increasing fuel, labor, maintenance, vessel cost, existing and proposed offshore oil and gas leases (State and Federal), tanker transportation of foreign and Alaskan crude oil imports, and other vessel traffic (see Sections I.C., III.B.1, III.B.2, III.B.3., III.C.5., III.C.6., III.C.12., IV.A.4., IV.C.3, and IV.D for descriptions of these actions).

Natural fluctuations in fish and shellfish populations, competition with foreign fishermen, changes in market conditions, restrictions on fish harvests and increasing fuel, labor, maintenance, vessel cost, probably are the most important stresses on commercial fishermen. (See discussion in Section IV.E.3.e).

Oil spills from existing and proposed leases, tanker transportation of foreign and Alaskan crude oil imports and other vessel traffic potentially could also be an important stress. The cumulative effect of oil from all of these sources is expected to result in 1) a moderate economic loss to some commercial salmon fishermen due to a reduction in salmon stocks for 5 years or more, and 2) a very high economic loss to commercial fishermen from at least one port if a large oil spill hits shore since fishermen could be prevented from leaving port by oil containment booms. (See Section IV.E.3.e).

Many manmade structures exist or are expected to be placed in California waters as a result of existing or proposed State and Federal offshore oil and gas leases (See Sections VI.C.3 and VI.D.4 for details). Also, a small number of temporary abandonments and debris exist or are expected in these areas. The cumulative impact of all of these structures is expected to cause a moderate economic loss to trawl fishermen for at least 3 years since not all problems have been resolved with at least one existing pipeline in the Santa Barbara Channel, and it is possible that similar problems may occur with another pipeline when laid. (See discussion in Section IV.E.3.e). At the same time, platforms provide a small benefit to commercial fishermen as navigational aids and as places to obtain emergency help.

Vessel traffic from existing and proposed leases, tanker transportation of foreign and Alaskan crude oil imports, and other ships usually create low navigational hazards to fishing. Geophysical vessel operations from existing and proposed leases are expected to cause a small amount of fishing gear loss (see discussion in Section IV.E.3.e).

The cumulative effect of all of these stresses, particularly non-OCS related stresses, is expected to cause high economic losses to the commercial fishing industry.

Sportfishing. Public participation in sportfishing is expected to increase slightly without the proposal. Limited transportation to offshore fishing areas is a major restraint on continued growth since available private recreational boating facilities are limited. Sportfishing success from private skiffs, piers, partyboats, and from beaches will continue to be subjected to natural fluctuations in fish and shellfish populations.

Recreation. Recreation will continue to grow in the absence of Proposed Sale No. 73, and will continue to risk impact from sources such as municipal sewage, regulated access, and rising costs. The expected change in recreational activities without the proposed sale would still be an increase in amount of participation and construction of facilities. This is due to more time being available to people for leisure activities. The restraints on this growth are available cash and availability of gasoline, and this would tend to have people utilize facilities closer to their towns than are presently used.

Tourism. California is a major vacation destination in the United States, and tourism is anticipated to continue to increase in the future. At the present time the economic situation in the country has reduced the overall availability of discretionary income. If this continues, the increase in tourism will not be as great as has been seen in the last several years.

The availability of gasoline could also affect the tourist industry. The reductions in supplies of gasoline experienced during 1974 and 1979 caused reduced attendance in several popular tourist areas nationwide.

Visual Resources. Without the proposal, expected changes to the visual resources of the area will be relatively minor, and restricted primarily to increases in residential development along the backshore, and the development of recreational facilities along the shore. This will tend to cause a slight reduction in the quality of the visual resource. This development will be the responsibility of the local areas. Overall, the quality of the visual resource is expected to remain at about the present level with minor changes.

Cultural Resources. Terrestrial: With increased residential and industrial development, the coastal lands will be more intensively surveyed for archaeological sites. As a result, more resources will be identified and archaeological data will increase. Although some mitigation will be undertaken in most cases, it is likely some damage and looting will occur. There will be continued deterioration with age of some historic landmarks, but the current interest in protection and preservation will positively affect an even greater number of these sites than at present. Gathering by ethnic groups will continue to be a problem, because of excessive stress being placed on the intertidal areas by over-harvesting. Coastal Native Americans will find subsistence and ceremonial gathering increasingly difficult as the supply of traditional foodstuffs decreases. Access to traditional gathering places will be variable.

Offshore: Aboriginal artifacts, sites and historic shipwrecks will be subject to continued artifact hunting by sportdivers. Divers have, however, been one of the best sources for discovering sites, and should continue to be so in the future. Some submerged cultural resources will be destroyed or damaged by natural forces as they continue to lie on the bottom. However, those historical and prehistorical resources protected by sediments or in deep cool waters will continue to be preserved for a great many years.

Ports and Harbors. Without the proposal, ports and harbors in the sale area and the Santa Barbara Channel would continue to be used to support activity from past and future offshore California lease sales. Presently, it appears that adequate crew base facilities needed to support existing Santa Maria Basin and western Santa Barbara Channel hydrocarbon activities can be incorporated into existing or assumed to be existing (e.g., Gaviota or Los Flores Canyon) sites. However, industry and state and local planning jurisdictions are considering Port San Luis as a possible site for a crew base to support Sale 53 and RS-II activity. Also Port Hueneme is being considered for expansion.

Marine Traffic. Without the implementation of the proposal, increases in marine vessel traffic and surface structures will result in more incidents among vessels and between vessels and structures. Increases in marine vessel traffic are expected to occur as a result of future planned projects (see Section IV.D.) and future increases in commercial, military, and private marine traffic. Predicted increases in the sale area include the following (see Table IV.D.4-1): 1) Federal leased lands - over 45 exploration wells and over 10 platforms; 2) Proposed State Tidelands Lease Sale - Pt. Conception to Pt. Arquello - 25 exploration wells, 6 platforms, and one marine tankering facility. The total existing and known future exploration and development activities in state and federal waters offshore Central and Southern California are: over 526 exploration wells, over 59 platforms, over 7 artificial islands, and over 21 marine tankering facilities. The effect of these increased hydrocarbon activites could result in moderate impacts on vessel traffic. Without the proposal, there would be no potential, proposal-related benefits of displacing Alaskan North Slope crude (i.e., reduction of Alaskan tanker trips to California).

Refineries. Even without the proposal, other hydrocarbon projects (Section IV.D.) and future increases in oil production could result in high impacts to refineries. The impacts would be the result of needed modifications to the refining process to handle past and future California OCS crude of low quality.

At this time, it is thought (Felts, 1983; Dames and Moore, 1982) that Alaskan North Slope (ANS) crude oil could be displaced from the California refinery slate due to the lower cost of offshore California crude. Due to this lower cost of California crude, there would be economic incentives for the refineries to make modifications to handle low quality crudes. Not including future federal lease sales, Felts (1983) estimates that $14 billion could be realized by California refiners processing offshore California crude in place of ANS crude. This is based on an estimated minimum refining advantage of $8/bbl for refining OCS crude in place of ANS crude, and a total of 1.8 billion bbls of offshore California crude. Future federal and state offshore lease sales would make this venture even more economically feasible. Environmental offsets could reach $1 billion (Bech et al., 1982). Thus, at this time, it appears economically feasible for California refiners to make the needed retrofits.

In the event that the proper permits for retrofitting cannot be obtained from state and local governments, or if retrofitting proves to be economically infeasible, then some of the California OCS crude production would need to be tankered to the Gulf of Mexico for refining.

Offshore Structures. Without the implementation of the present proposal, increases in marine vessel traffic and surface structures will result in more vessel-structure accidents. Increases in marine traffic are expected to occur as a result of future planned projects (see Section IV.D.) and future increases in commercial, military, and private marine traffic. Predicted increases in the sale area include the following (see Table IV.D.4-1): 1) Federal leased lands - over 45 exploration wells and over 10 platforms; 2) Proposed State Tidelands Lease Sale between Pt. Conception and Pt. Arquello - 25 exploration wells, 157 development wells, 6 platforms, and one marine tankering facility. The total existing and known future exploration and development activities in state and federal waters offshore Central and Southern California are: over 526 exploration wells, over 1862 development wells, over 59 platforms, over seven artificial islands, and over 21 marine tankering facilities. The effect of these increased hydrocarbon activities could result in low impacts to offshore structures in the sale area. Higher impacts would likely occur in the area of greatest hydrocarbon activity (i.e. Santa Barbara Channel).

The Federal leasing, exploration and development statistics covering all past Federal lease sales is presented in Table IV.C.3-1. The exploration and development estimates expected to result from leased tracts in the Santa Maria Basin (Sale No. 53 and RS-2) and State Waters (Point Arguello to Point Conception) are given in Table II.A.1.b-2. The existing hydrocarbon platforms in the State Waters of the Santa Barbara Channel are presented in Table III.C.6-3

(BLM, 1981). Activities associated with increased exploration and development on the OCS include: additional use of drilling vessels, platforms, support vessels, helicopters and geophysical survey vessels.

Military. The overall impacts expected as a result of the proposal would be reduced from high (significant modifications to military operations required) to none. The substantial overlap between the proposed sale and military operating areas would be eliminated (space-use conflicts) along with the Proposals anticipated vessel traffic and structure placements.

As a result of anticipated future OCS and State Tideland lease sales in Central California, future impacts to military operations are expected to be high, as the military uses approximately 55% of the OCS for various military operations, many of which require "exclusive-use" or joint-use with extensive coordination with other OCS users. Leases issued as a result of past OCS lease sales in California have had the leases stipulated with the Standard Military Stipulations. This is believed to adequately mitigate any impact to military operations. These lease stipulations would be a future option as well.

The impacts to miltary operations from OCS oil and gas activities would result from increased vessel traffic and the placement of permanent and semi-permanent offshore structures, as well as potential oil spills. The increased vessel traffic would necessitate extensive patrolling, surveillance, and clearance of an area prior to dangerous or classified military operations, causing additional time delays for the military operations. The placement of OCS structures would further limit the areas available to many military activities which require exclusive-use of the OCS, possibly forcing the elimination or significant modification of these activities. Additionally, potential oil spills in the area of OCS oil activities (including tankering) would temporarily increase vessel traffic in the vicinity of an oil spill due to cleanup efforts, thereby limiting military activities in that area until the cleanup operations are completed.

K. Unavoidable Adverse Impacts

Offshore operations would have low to very low unavoidable impacts on water quality. Drilling, construction activities, and pipelaying would cause an increase in turbidity in surrounding waters. Discharge of treated sewage from rigs and platforms would increase levels of suspended solids, nutrients, chlorine, and BOD in a small area. Chronic spills from platforms and the discharge of formation waters would cause increases in hydrocarbons and possibly trace metals in the surrounding waters. Moderate impacts on water quality would be expected from the one predicted oil spill in the proposed lease sale area.

Offshore oil and gas development would cause slight increases in onshore concentrations of NO_x, SO_x, TSP, CO and O_3. Emission controls or appropriate emission offsets may be necessary to insure compliance with ambient air quality standards. This could limit growth of certain onshore industrial activities.

Minor alterations in subtidal benthic communities would occur in the vicinity of production platforms and drilling and pipeline laying and burying operations. Toxic materials from the discharge of drilling fluids and cuttings may adversely affect some hardbottom communities in a limited area in the vicinity of platforms.

High mortality to the northern fur seal population requiring one to two decades for recovery could occur if the one oil spill expected to contact the Northern Channel Islands buffer zone were to take place during pupping or breeding season. Low to moderate mortality to the California seabird population requiring 5 to 10 years for recovery would occur due to the oil spill expected to contact the Northern Channel Islands buffer zone. Low impacts to seabirds would be expected in other areas. A small mortality to endangered or threatened brown pelicans, sea otters, and gray whales would be expected with recovery occurring in less than two years.

Moderate impacts would be expected to public services and facilities causing short-term stress of local systems. High impacts would occur to water supply systems requiring modification of existing systems or construction of new facilities. Minor impacts to wastewater tratment facilities for the proposed lease sale area would occur, causing localized stress. Moderate localized impacts to roads and highways would occur at Avila Beach.

Moderate impacts would be expected to trawl fishermen in the proposed lease sale area causing a 10 to 20 percent economic loss to the trawl fishing industry for at least three years. Overall, the expected regional impacts to commercial fisheries would be low (less than a 10 percent economic loss to the industry).

The proposed project would cause minor degradation in visual quality from offshore structures. Localized moderate impacts (significant possibility of both presence and disturbance of cultural resources) could occur at Point Conception from offshore structures.

High impacts to Port San Luis (on an alternative site that is approved by State and local planning jurisdictions) would be expected due to the need for additional docks, berths, and related facilities. Low impacts to marine traffic offshore Central California and the Santa Barbara Channel would occur due to increases in tanker traffic, support vessel activity, and number of offshore structures.

Refineries in the San Francisco Bay area and the greater Los Angeles area would be induced to make expensive modifications to the refining process to handle low quality crude oil.

Impacts on military operations would be expected due to an increase in the surveillance/clearing efforts of an area prior to hazardous operations, and a small increased risk of potential life/property threatening accidents. Although serious impacts to military operations are expected as a result of the proposal (see Section IV.E.3.o.), all except the impacts listed above could be avoided by the adoption of military stipulations (see Section II.A.1.f.).

No significant unavoidable, adverse impacts to other resources would be expected. However, although unlikely, the proposal could result in: 1) damage or destruction of a few marine cultural resources by structure siting and achoring or by oil spills; and 2) damage to biological or other resources from oil spills (see Section IV.E.).

L. Relationship Between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed OCS Sale No. 73 would result in the production of 291 million barrels of oil and 285 billion cubic feet of gas over a 20-year period, according to the most likely resource estimate. This would represent a short-term gain by providing for some energy requirements and helping reduce imports of foreign oil. The estimated total undiscovered recoverable hydrocarbon resources for the Proposed Sale No. 73 area is 970 million barrels of oil and 950 billion cubic feet of gas. Thus about 30 percent of the total recoverable oil and gas reserves would be used up.

If these oil and gas resources are explored, found, and developed, then these short-term uses of man's environment are expected to eventually have the following effects on the maintenance and enhancement of long-term environmental productivity of the Central California coast and adjacent offshore areas.

1) Oil and gas resources used now would not be available for use at a future time;

2) Subtidal benthic communities immediately around production platforms would remain altered for an unknown (but limited) period of time after the platforms are removed;

3) Land use once changed from natural or open space zoning to industrial or commercial use zoning probably would not be rezoned to its current (natural or open space) zoning; and

4) National security may be affected by the interruption of military operations (although most of these impacts could be mitigated).

All other impacts from the proposal are expected to be short-term and are not expected to significantly affect long-term productivity.

Although unlikely, the proposal could affect long-term productivity if it results in:

1) Damage or destruction of a few marine cultural resources by structure siting and anchoring or by oil spills; and

2) Damage to biological or other resources (as discussed in Section IV.E.) from oil spills.

M. Irreversible and Irretrievable Commitment of Resources

Estimated total production associated with the Proposed Sale No. 73 would consist of 291 million barrels of oil and 285 billion cubic feet of gas. These resources, once developed and consumed, would be irretrievable.

The proposal also is expected to result in the eventual irreversible and irretrievable commitment of:

1) Some scarce resources, such as raw materials, specialized labor, and capital. These resources would be drawn away from other used in other areas, thus depriving society of their potential benefits;

2) Some natural or open space land since once these aras have been used for a more intensive use (e.g., industrial or commercial development) it is seldom returned to its original use or condition; and

3) National security since interruption of military operations may affect national security (although most of these impacts could be mitigated).

No significant irreversible and irretrievable commitment of other resources are expected. However, although unlikely, the proposal could affect long-term productivity if it results in:

1) High mortality to marine mammals if a very large oil spill were to occur.

2) Damage or destruction of a few marine cultural artifacts by structure siting and anchoring or by oil spills.

N. Environmental Impacts of a One Hundred Percent Tankering Transportation Scenario

A hypothetical total tankering scenario has been developed for environmental analysis purposes in this document. The total tankering scenario was requested to be included in the FEIS by the State of California and other agencies. All produced oil would be tankered from offshore locations to shore for refining in this scenario (see details of the transportation scenario below).

The most likely oil resource estimates for this scenario are the same as those described for Alternative I: 291 million bbls (see Table II.A.1.c-1). All produced gas resources are assumed to be reinjected into the producing formation for the purposes of analysis in this scenario. The estimated exploration and development time table, the number of expected exploratory wells, and the number of expected platforms are the same as those described for Alternative I (Table II.A.1.c-1). It is also assumed that all proposed-related crude oil refined in California would displace an equal amount of Alaskan North Slope Crude. This assumption was also made for Alternative I (see Section II.A.1.d). The details of the tankering scenario are presented in Table IV. N-1. The same hypothetical platform locations that were used for the Alternative I analysis (Table II.A.1.d-1) are used in this scenario. No oil would be transported by pipeline to shore in this scenario. Oil is assumed to be tankered from two floating Offshore Storage and Treating (OS&T) facilities. Each OS&T would be located about two miles from the platform location. The OS&T would be permanently moored to a single anchor leg mooring system. Oil would be transported from the sale area in the following proportions: 25 percent of the total production would be tankered to the San Francisco Bay area; 50 percent of the total production would be tankered to the Ports of Los Angeles-Long Beach; and 25 percent of the total production would be tankered to the Gulf of Mexico for refining. This is the same volume-distribution as was assumed for analysis of the original proposal (Alternative I).

Two sizes of tankers are assumed to be used: 27,000 Dead Weight Tons (DWT) and 45,000 DWT. The 27,000 DWT tankers can carry about 200,000 bbls of oil, while the 45,000 DWT tankers carry about 335,000 bbls of oil. In the peak year of production (1993), 39 round trips would be made (see Table IV.N-1) by a 27,000 DWT tanker to the San Francisco Bay area from the sale area (platform location No. 2). Tankers en route to San Francisco Bay from the sale area were assumed to traverse the Coast Guard-recommended vessel traffic lanes. A total of 78 round trips (39/tanker, 2 tankers required) would be made in the peak year by 27,000 DWT tankers from the sale area (platform location No. 4) to the Ports of Los Angeles-Long Beach. Tankers en route to Los Angeles-Long Beach were assumed to follow the existing vessel traffic lanes off Point Conception through the Santa Barbara Channel to the ports. Forty-five thousand DWT tankers would be used to transport oil to the Gulf Coast. A total of 14 round trips (7/tanker, 2 tankers required) would be made in the peak year from platform location No. 2. A total of 10 round trips would be made in the peak year from platform location No. 4. Tankers in transit to the Gulf Coast were assumed to cruise to the south of the Channel Islands. Support vessel (i.e., crew and supply boats) activities and needs would remain the same as those described for the proposal (Alternative I). Port San Luis would still be used as a crew base and Gaviota would be used as a supply boat base.

TABLE IV.N-1

HYPOTHETICAL TANKERING TRANSPORTATION SCENARIO
BASED ON MOST LIKELY OIL RESOURCE ESTIMATES FOR PROPOSED SALE 73[a]

PRODUCTION (Peak Flow Rate)		PIPELINES			TANKERS				
Year	b/d	Routes	d (in)	L_P (mile)	Routes	Peak Production (b/d)	Size (dwt)	L_T (nm)	rt/y
1993	84,300	1 to 2*	8	12	A	21,075	27,000	205	39
		3 to 4*	8	24	B	42,150	27,000	166	39/tanker 2 req'd
		5 to 4*	8	22	C	12,645	45,000	4,400	7/tanker 2 req'd
					D	8,430	45,000	4,400	10

[a]All gas production is assumed to be reinjected into the producing formation.
*Floating offshore storage and treating facility permanently moored to a single anchor leg mooring system or equivalent.

Legend

b/d Barrels Per Day
d Pipeline Diameter
dwt Dead Weight Ton
in Inches
L_P Pipeline Length
Mile Statute Mile
nm Nautical Mile
rt/y Round Trip Per Year

L_T Tanker Route - Distance One Way
1,2,3,4,5 - Hypothetical Platform Locations
A - Tanker Route from Platform No. 2 to San Francisco Bay Area
B - Tanker Route from Platform No. 4 to Ports of Los Angeles/Long Beach
C - Tanker Route from Platform No. 2 to Gulf of Mexico Coast
D - Tanker Route from Platform No. 4 to Gulf of Mexico Coast

All oil is assumed to be processed on the OS&T's located offshore. Therefore, there would be no onshore processing at the Nipomo Mesa facility or Gaviota facility.

Summary of Oil Spill Model Results

The oil spill accident spill rate for tankers is 1.3 large spill ($\geq$ 1,000 bbls) per billion barrels transported, and for pipelines is 1.6 large spills per billion barrels transported (Futune's Group 1982; Lanfear and Amstutz, 1983). These rates are an update used for Proposd Sale No. 73, incorporating a larger and more current data base than the rates used previously (OCS Sales 53, 68, etc.). These new rates indicate that pipelines have a higher spill rate than tankers, the opposite of the old record. Pipelines are therefore no longer safer overall on a long-term basis than tankers. However, pipelines may still be environmentally preferred for several reasons. These reasons include: 1) Tankers carry a much greater volume of oil than pipelines at any given time. For example, a tanker of 45,000 DWT (typically used on the California OCS for crude oil transport) carries about 335,000 bbls of oil, whereas a 10-inch pipeline, 32 nautical miles long, carries about 19,000 bbls (John Kopeck, personal communication). Thus, though the overall spill rate may be lower for tankers, the risk of a catastrophic spill and environmental disaster are much greater for tankers than pipeline; 2) The operational nature of tankers results in more negative impacts to air quality, through engine combustion and transferring and lightening operations; 3) The increased use of tankers will result in more vessel traffic and increased competition for port facilities.

In addition to the oil spill rates being lower for tankers than pipelines, another factor important in the oil spill model result is as follows: The oil moved by pipelines often poses a double threat of spills to the environment. This is because typically oil is piped onshore to be processed, and then tankered (or piped by onshore pipeline) to another location for refining. In the case of oil being tankered from offshore locations, it is being moved just once before entering a refinery. The oil spill model accounts for the movement of oil to onshore processing facilities and then on to refineries (by either onshore or offshore transport).

The following summarzies the overall oil spill model results for the proposal (mixed mode transportation) and the all-tankering (for the proposal) scenario. See Appendix F for more detailed information. The total number of spills expected as a result of the Proposal (most likely case) and the all-tankering scenario are both one (0.90 and 0.67 statistically). The probabilities of one or more spills estimated to occur are 59% for the Proposal and 49% for the all-tankering scenario. Although the actual numbers have been reduced with all-tankering, one spill is still expected.

The oil spill model results for the individual resource target areas have been reduced as well. Previously, the only target (besides "LAND") expected to be contacted by an oil spill was the northern side of the Channel Islands Marine Sanctuary (26 percent probability of oil spill occurrence and contact) This target is no longer estimated to have a spill occurring and contacting it (17 percent probability). The sea otter range was not predicted to have an oilspill occurrence and contact (13 percent probability of one or more spills occurring and contacting), and this is further reduced by the all tankering scenario (3 percent probability).

The individual land segments showed no spills expected to occur and contact them. The estimates for the land segments with all tankering still show no expected occurrence and contact, the probabilities being further reduced. Although no contact is expected, segment No. 39 (northernside of San Miguel Island) again showed the highest risk of oil spill occurrence and contact of any segment in the sale area (7 percent probability).

Conclusions: The all-tankering scenario showed no overall difference from the proposal, both of which resulted in one spill estimated to occur over the life of the proposal. Although the oil spill probabilities are reduced with the all-tankering scenario, the only expected change to individual land segments or targets was to the Channel Islands Marine Sanctuary (northern side), where one spill was expected to occur and contact it for the proposal, and none is expected for the all-tankering scenario.

The comparison of impacts between the total tankering scenario and the Most Likely scenario used for analysis in Section IV.E. is presented below (Sections IV.N.1, 2, and 3).

1. Physical Environment

a. Water Quality

i. Discussion: The impacts to water quality from OCS oil and gas activities would decrease from the levels described for the original proposal (Alternative 1) if oil is moved entirely by tankers. The decrease in impacts would be slight because of the removal of turbidity effects associated with pipeline laying. This would remove impacts within a few meters of any proposed pipeline route and reduce the amount of sediments displaced by pipelines. The impact level to water quality would remain as described in the original proposal for all other routine discharges (e.g., moderate within 300 meters tapering off to very low at distances greater than about 1000 meters).

The predicted number of oil spills would also drop with the all tankering option from a statistical 0.90 spills larger than 1000 barrels in the original proposal to 0.67 spills greater than 1000 barrels for the all tankering option. This would reduce the expected levels of impacts to water quality slightly. However, should a spill occur, the impact level would remain as described in Section IV.E.

ii. Conclusion: The all tankering option would slightly reduce the levels of impacts to water quality from sediment displacement associated with pipelines and impact expected from oil spills. The reduction in impact level is slight and would not change the qualitative impact level description. Overall, water quality impacts would remain low.

b. Impact on Ocean Dumping

i. Discussion: The impacts and impacting agents on this resource category are discussed in Section IV.E.1.b. Since there were no expected or potential impacts on Ocean Dumping as a result of pipelines in the original proposal (Alternative I), the impact level for the all-tankering scenario would remain the same as Alternative I. This impact level was very high.

ii. Conclusion: Impacts on ocean dumping are expected to remain the same (very high) as the original proposal (Alternative I).

c. Impact on Air Quality

i. Discussion: Impacts on air quality were estimated using the California OCS Air Quality Handbook (FSI, 1983a). The general methodology and main technical assumptions are described in Section IV.E.1.c. This section only describes those impacts that are different from the ones described in Section IV.E.1.c.

During the exploratory and development phases, emissions would not be significantly different from those associated with the pipeline scenario. Impacts would not be significantly different from those described in Section IV.E.1.c. During the production phase, emissions of VOC and SO_2 would be much higher than for the pipeline scenario. The increase in VOC emissions is due to fugitive losses during transfer of crude oil to the OS & T and the tanker. The increase in SO_2 emissions is due to exhaust from the ship's engines used to pump crude oil onto the tanker. Emissions of NO_x, CO and TSP would not change significantly.

The maximum predicted onshore concentration of SO_2 was 0.02ug/m^3. The DOI Significance Level is 1 ug/m^3. The maximum predicted 3-hour and 24-hour average SO_2 concentration was 26 and 5 ug/m^3, respectively. The DOI Significance Levels are 25 ug/m^3 for the 3-hour average and 5 ug/m^3 for the 24-hour average. Since the DOI Significance Levels are equaled or exceeded, MMS would require best available control technology (BACT) on SO_2 emission sources. DOI air quality regulations are described in Appendix H. Potential mitigating measures are described in Appendix O. Onshore concentrations of SO_2 would be well below ambient air quality standards.

Photochemical modeling was performed to determine O_3 increments from tankering operations. Modeling was performed with trajectory endpoints at Nipomo, Santa Ynez, and Goleta. The trajectories are illustrated in POCS Technical Paper No. 83-2 (FSI, 1983b) and in the Pacific OCS Air Quality Handbook (FSI, 1983a). Maximum O_3 increments were 0.5 to 1 parts per hundred million (pphm) for the Nipomo trajectory, 6 to 10 pphm for the Santa Ynez trajectory, and 0.5 to 2 pphm for the Goleta trajectory. The O_3 increments associated with the Nipomo and Santa Ynez trajectories would result in O_3 concentrations exceeding the national standard. DOI air quality regulations state that MMS will require emission controls on OCS emission sources that may result in adverse effects on onshore air quality. Tankers would have to use vapor balance lines during crude oil loading operations at the OS & T. More details on the air quality review process and mitigation requirements are given in Appendix H. A discussion of potential mitigating measures is given in Appendix O.

ii. Conclusion: If crude oil is transported by tankers, concentrations of SO_2 and O_3 would be higher than if it is transported by pipeline. Maximum onshore SO_2 concentrations were predicted to equal or exceed DOI Significance Levels. Maximum onshore O_3 concentrations could exceed national ambient standards. Emission controls would be needed to reduce emissions of SO_2 and VOC. Air quality impacts would be moderate due to the potential for increased O_3 concentrations (see definitions in Chapter IX). Overall, the impact level would remain the same as those for the original proposal (i.e., moderate impacts).

2. Biological Environment

a. Impact on Intertidal Benthos

i. Discussion: The impacting agents on this resource category are discussed in Section IV.E.2.a. The all-tankering scenario would eliminate subsea pipelines to shore at Nipomo Mesa and the Point Conception area. This would eliminate the localized moderate (pipeline-related) impacts on intertidal communities along the pipeline route in the Point Conception area and the moderate or possibly high impacts to some endemic species along the pipeline route on the Nipomo Dunes.

The all-tankering scenario will not change the expected impacts on intertidal communities from large oil spills, as impacts were not expected from the original proposal (Alternative I). The all-tankering scenario would not significantly decrease the potential moderate impacts to the sensitive rocky intertidal areas (Table III.B.2-1) or the low to high (during prolonged seas) impacts to Pismo clams on Pismo Beach, although the probabilities for contact do decrease slightly.

ii. Conclusion: The all-tankering scenario would eliminate the localized moderate impacts to intertidal communities in the Point Conception area. The scenario would also eliminate moderate or possibly high impacts to some endemic species of the Nipomo Dunes. Impacts to other intertidal communities would not differ significantly from Alternative I (i.e., no expected impacts).

b. Impact on Subtidal Benthos

i. Discussion: The impacting agents on this resource category are discussed in Section IV.E.2.b. The all-tankering scenario would eliminate the subsea pipelines that go from the hypothetical offshore platform locations to shore at Nipomo Mesa and the Point Conception area. Overall, the impacts to the subtidal benthos would remain the same (i.e., low) as described for the original proposal (Alternative I). However, since the all-tankering scenario reduces the total number of miles of subsea pipelines, it also reduces certain impacts to the subtidal benthos. This scenario would reduce the number of miles of localized low (soft bottoms) and moderate (hard bottoms) pipeline-related impacts from 228 miles to 58 miles.

The all-tankering scenario will not significantly change potential oil spill related impacts to subtidal benthic communities, although the probabilities for contact (of shallow water benthos) will be decreased slightly.

ii. Conclusion: The area-wide impacts on the subtidal benthos from the all-tankering scenario would remain the same as the original proposal (i.e., low). However, this scenario would significantly reduce the number of miles of localized low (soft bottoms) and moderate (hard bottoms) pipeline-related impacts.

c. Impact on Fish Resources

i. Discussion: This scenario would not significantly change expected impacts to fish resources. (No significant impacts from the proposal were expected.)

This scenario also would not significantly change potential impacts to fish resources, although the probabilities for contact decrease, because fish resources could still be contacted by oil spills.

ii. Conclusion: This scenario would not significantly change impacts to fish resources (i.e., expected impacts remain very low).

d. Impact on Marine Mammals

i. Discussion: Impact agents will remain the sames under the Most Likely Scenario (See Section IV.E.2.d) with the exception of oil impacts to the northern fur seals on San Miguel, oil impact levels are also the same as those under the Most Likely Scenario. Impacts due to noise and disruption from platforms and seismic activity are estimated to be low (activity levels are estimated to be the same as in the Most Likely Scenario). Impacts from the one at sea oil spill are also estimated to be low (some mortality to pelagic northern fur seals requiring 1 to 3 years for recovery). See Appendix A for definitions of impacts. Impacts to the northern fur seals of the San Miguel colony are estimated to be low (mortality to some seals feeding at sea, recovery 1-3 years) under the 100% Tankering Scenario rather high as in the most likely scenario due to the difference in the probability of contact with the northern portion of the Channel Islands National Marine Sanctuary (26 percent in the Most Likely Scenario vs 18 percent in the 100% Tankering Scenario). By definition this changes the contact from "estimated to occur" (probability greater than 0.25) to not estimated to occur (probability less than 0.25 percent). See Section IV.A.4.a for a further discussion of estimated events. Of concern, however for most marine species is the size of the spill. A major tanker oil spill is much larger than pipelilne spills. An oil spill from a 45 DWT tanker (see transportation section) could be on the order of 335,000 bbl of oil. Fifteen nautical miles of 10 inch pipeline contains about 9000 bbl of oil. Devastation of a population is much more likely from a tanker spill.

ii. Conclusion: Impacts to marine mammals are estimated to be low (mortality or loss of reproduction requiring 1 to 3 years for recovering). These impacts are lower than those under the most likely scenario. However, of concern is the size of large tanker spills and their potential for devastation of a population.

e. Impact on Seabirds

i. Discussion: Impact agents will remain the same as under the Most Likely Scenario (Section IV.E.2.e) with the exception of oil impacts to the Cassin's auklets on San Miguel, impact levels are also the same. No contact with the buffer zone around San Miguel is now expected. Impacts from the one at sea spill are estimated to be low (some mortality to at sea birds requiring 1 or 2 years for recovery). (See the previous Section IV.N.2.d, Marine Mammals for a discussion of the changes in oil spill numbers and their significance.)

Impacts due to noise and disruption are estimated to be low. Activity levels are estimated to be about the same as in the Most Likely Scenario.

ii. Conclusion: Impacts to seabirds are estimated to be low (mortality requiring 1-2 years for recovery). These impacts are lower than those under the Most Likely Scenario. However, of concern is the size of large tanker spills and their potential for devastation of a population.

f. Impact on Threatened and Endangered Species

i. Discussion: Impact agents and levels will remain the same as under the Most Likely Scenario (see Section IV.E.2.e). That is impacts to endangered or threatened brown pelicans, sea otters and gray whales are expected to be low (some mortality requiring less than 2 years for recovery). Impacts to other species should be very low. Section IV.2.e discussed changes in activitie due to 100% tankering. Of concern to endangered species are the large size of potential tanker spills when compared with pipeline spills.

ii. Conclusion: Impacts to endangered and threatened species are estimated to be low for brown pelicans, sea otters and gray whales. Impacts to other species are estimated to be very low. Of concern, however is the size of large tanker spills and their potential for devastation of a population.

g. Impact on Estuaries and Wetlands

i. Discussion: The impacting agents on this resource category are discussed in Section IV.E.2.g. Impacts from the all-tankering scenario would remain the same as the original proposal (Alternative I): no expected impacts on estuaries and wetlands. This is because oil spills are not expected to contact this resource category. The all-tankering scenario is not expected to decrease the potential high to very high oil spill related impacts to estuaries and wetlands, although the probabilities for contact decrease slightly.

ii. Conclusion: Impacts from the all-tankering scenario are expected to remain the same as those described for the original proposal (Alternative I): no expected impacts on estuaries or wetlands.

h. Impact on Areas of Special Concern

i. Discussion: The impacting agents on this resource category are discussed in Sections IV.E.2.a, d, e, f and g. The all-tankering scenario is not expected to change the expected impact to any designated area of special concern. Pipeline-related impacts would be eliminated for a sensitive, relatively unaltered rocky intertidal shore and sand dune community, as discussed in Section IV.N.2.a, above. The all-tankering scenario will not significantly decrease the potential oil spill related impacts (i.e., moderate to high) to designated areas of concern, although the probabilities for oil contact decrease slightly.

ii. Conclusion: The all-tankering scenario would not change the expected impacts on designated areas of special concern (i.e., no expected impacts).

i. Impact on Point Reyes/Marine Sanctuaries

i. Discussion: The impacting agents on this resource category are discussed in Section IV.E.2.a, d, e, f, g and l. The all-tankering scenario is not expected to change the expected impacts that were described for the original proposal (Alternative I) (i.e., no impacts). The all-tankering scenario will not significantly decrease the potential oil spill related impacts on this resource category, although the probabilities for oil contact decrease slightly.

ii. Conclusion: The all-tankering scenario would not change the expected impacts on this resource category (i.e., no impacts).

3. Socioeconomic Environment

a. Impact on Coastal Economy

i. Discussion: The methodology for determining the impacts of the proposal on the coastal economy are explained in Section IV.E.3.a. The tankering scenario is expected to reduce the peak level of employment because of fewer miles of pipeline to be constructed and the absence of any need for landfalls associated with pipeline construction. If this scenario were to occur, peak employment would be expected to increase by 1,200 jobs, and earnings would rise $77 million, or approximately 85% of the level associated with the transportation scenario used to determine the impacts in Section IV.E.3.a. The permanent increase in jobs as a result of this scenario is 530 or 109 percent of the expected change from the most likely scenario. Earnings are expected to rise by about $33 million or 110 percent of the change associated with the most likely scenario.

ii. Conclusion: The impact levels of this scenario on employment would remain very low because the expected permanent increase is less than one percent change from the base (0.18 percent). The change in employment from this scenario remains low, because the change is an increase of one to three percent (1.2 percent).

b. Impacts on Demography

i. Discussion: The methodology for determing the impacts on demography from the proposal are discussed in Section IV.E.3.b. This scenario would result in a peak increase in population of 1,310 and a permanent increase in population of 810. The expected increases from this scenario are 93.2 and 111 percent of the increases expected from the most likely scenario.

ii. Conclusion: The expected level of impacts remains very low, because the permanent population change is less than one percent (0.12 percent).

c. Impact on Public Services and Facilities

i. Discussion: Impacts, as a result of the total tankering scenario, to public services and facilities, water supply, wastewater treatment capacity, transportation systems and electrical power, would remain as discussed for the proposal. Most of the anticipated impacts occur because of the needs of crew and supply bases. The one exception is the impact to the water supply from existing facilities. Removal of the expected oil and gas resulting from this sale from these onshore processing facilities would reduce the demand for water from the facilities. A demand would still occur from existing uses (i.e., general use, other non-energy uses) and from processing required as a result of previous sales. While, overall, the impact to the water supply would not be reduced significantly because of other impact agents (e.g., general population growth, other uses), there would be a slight reduction of the impact on the water supply, should all oil be tankered out of the proposed sale area.

ii. Conclusion: Impacts to public services and facilities would remain the same as the proposal. However, there would be a slight reduction in the impact on water supply. Overall, impacts are expected to remain moderate.

d. Impact on Coastal Land Use

i. Discussion: Tankering all oil production to would not change the impacts to coastal land use. Impacts to land use from this sale occur from the development of Port San Luis as a crew base. This use remains under the total tankering scenario. No pipeline landfalls would be required nor onshore pipelines for transporting production to processing facilities onshore. As pipelines are a permitted use in almost all land use categories there was only a very low impact (no incompatability with existing zoning) expected. This very low impact would be removed under this scenario.

ii. Conclusion: Overall impacts to coastal land use would remain as under the proposal, low impacts or low incompatability as impacts will be mitigated through the permitting process with localized moderate impacts to Port San Luis.

e. Impact on Commercial Fisheries

i. Discussion: This scenario would significantly decrease expected impacts to commerical fishermen from pipelines because it would significantly reduce the number of miles of pipeline expected (228 miles decreases to 58 miles). In 1981, the value of the trawl fishery to the proposed sale area (using a multiplier of 3.1) was $6.2 million. The original proposal is expected to result in a moderate (10-20%) economic loss to trawl fishermen in the proposed sale area for at least 3 years. The total tankering scenario would reduce this loss to insignificant.

This scenario would not significantly change potential impacts to commercial fisheries from oil spills , although the probabilities for oil spill contact decrease, because commerical fisheries could still be contacted by oil spills.

Other impacts to commercial fisheries would remain the same as described in Section IV.E.3.e. Therefore, overall expected regional impacts to commercial fisheries would remain low.

ii. Conclusion: The total tankering scenario would essentially eliminate the moderate (10-20%) economic loss that trawl fishermen in the proposed sale area are expected to sustain for at least 3 years due to pipelaying activities. Overall, expected regional impacts to commercial fisheries would remain low.

f. Sportfishing

i. Discussion: With the all-tankering option impacts to sportfishing activities from OCS oil and gas activities should remain at the low level described for the original proposal (Alternative I). Since this option eliminates the installation of two pipelines, impacts to shorefishermen would be reduced since no beach closures would be required during pipeline installation. On the other hand, absence of the pipelines would remove the artificial reef effect observed by fishermen along existing pipelines. The two OS&T's assumed with this scenario would preclude a small area from sportfishing, however, the size of this area should be very small since skiff fishermen (hook & line) may approach very closely to the OS&T. A slightly larger area may be precluded from fishing when large tankers are approaching, tie-up, and departing from the OS&T.

The minor increase in vessel traffic should not change the low impact on local sportfishermen expected from the original proposal. Port San Luis would still be used as a crew base and Gaviota would still be used as a supply boat base. The slight decrease in the probability of a major oil spill occurring is minor and would not change the qualitative impact levels described for the original proposal.

ii. Conclusion: Overall impacts to sportfishing activities would remain low, as described in the original proposal.

g. Recreation

i. Discussion: The original proposal predicts low impacts to recreational activities in the vicinity of the proposed lease sale. Differences in expected impacts with this scenario would stem from the elimination of two pipelines and the addition of two OS&T's. With the elimination of the two pipelines, beach closures necessary for pipeline installation would be avoided. The presence of two OS&T's located offshore should have very little effect on recreational activities. Recreational boaters, sailors and skiff fishermen are the only groups likely to be affected by the physical presence of the OS&T's and the tankers transiting the area. The impacts of the OS&T to these user groups would be minor.

ii. Conclusions: The all tankering option would not significantly change the expected impacts predicted with the original proposal. Overall, recreational impacts would remain low.

h. Tourism

i. Discussion: Tourists in this section of coastline frequently center their activities around the beaches. The original proposal had estimated the short-term closure of two beaches at Point Conception and Nipomo Mesa for the purpose of installing two pipelines. The total tankering scenario eliminates the need for these beach closures, thus reducing expected impacts to tourism. This scenario also plans for the installation of two OS&T's, each of which would be placed within 2 miles of an oil and gas platform. Since the OS&T's may deter visitors who demand an uncluttered view of the ocean, impacts to tourism from this option would be increased slightly.

ii. Conclusion: The total tankering scenario would eliminate the need for short-term beach closures during pipelaying , but would slightly increase from low to low-moderate impacts with the installation of visually degrading offshore structures. Overall, impacts to tourism from this option would remain low.

i. Visual Resources

i. Discussion: The visual resources of this Central California coastline contribute greatly to the success of the local tourist economy and recreational enjoyment. The scenario described as the total tankering option would both increase and decrease expected impacts to the visual resources in this area. Reduced impacts would be anticipated from the elimination of the two expected pipeline landfalls at Point Conception and Nipomo Mesa. With the proposal, installation of these pipelines could involve the short-term closure of 400 meters of beach at each site; the presence of large equipment onshore; and a large pipelaying barge located offshore; Following installation, an earth scar would be visible where the pipelines had been installed. Elimination of the two pipelines would remove the potential for these short-term impacts at the two beaches. Overall the visual resources on the beaches would not be degraded by these pipelaying activities, and the impacts to visual resources in these areas would change from low to very low.

However, the two OS&T's included in this scenario would increase the expected impacts to local visual resources by virtue of their presence alone. Tourists, residents and recreationists alike are usually not pleased with the site of offshore oil and gas structures off their coastline. The physical presence of the OS&T's and the occasional tankers being serviced would erode the visual quality of what is presently a visually pristine environment. Since the visual degradation from these offshore structures would not be short-term, as they would be with the original proposal, the total tankering scenario would be expected to increase local impacts to visual resources from low to high.

ii. Conclusion: Elimination of the pipelines included in the original proposal would serve to decrease local expected impacts to visual quality from low to very low, but , the added presence offshore of two OS&T's and their associated tankering activities would provide a long-lasting visual degradation to the local scenic quality, increasing expected impacts from low to moderate. Overall, areawide impacts from total tankering would be expected to remain low.

j. Impacts on Cultural Resources

i. Discussion: The all tankering scenario would remove the installation of subsea pipelines at Nipomo Mesa and the Point Conception area. This would remove the expected moderate impact on cultural resources for the Point Conception route and the expected low impacts on cultural resources for the Nipomo Mesa pipeline route (see Section IV.E.3.j. for details on these impacts). Onshore, along the pipeline right-of-way, all potential impacts would be removed. However, the overall impacts to cultural resources would remain low since no change in other imacts to cultural resources would occur.

ii. Conclusion: This scenario would eliminate the expected localized moderate impacts along the Point Conception area pipeline route and the expected localized low impacts for the Nipomo Mesa pipeline route. Overall, impacts to cultural resources would remain low.

k. Impacts on Ports and Harbors:

i. Discussion: Impacts to ports and harbors in Central California and the Santa Barbara Channel would not significantly differ from those described under Alternative I. This is because the support vessel activity and needs in this area would be the same as Alternative I, as would the amount of tankering to San Francisco Bay. Very low impacts would occur on the Ports of Los Angeles-Long Beach due to the additional tankering activity in this scenario. There were no expected impacts to these ports in the original proposal (Alternative I). The tankering scenario would generate a total of 78 round trips by 27,000 DWT tankers in the peak production year (1993) from the sale area to the Los Angeles-Long Beach ports (Table IV.N-1). Currently, about 7,000 large vessels arrive at the Ports. The U.S. Coast Guard (47 FR 27430-27434, June 24, 1982) predicts about 8,000 vessel arrivals in 1990. Thus, the proposal would represent about a one percent increase in vessel arrivals at the Ports in the peak year. The level of pilot boat activity would also slightly increase. These boats are used as tanker escorts into and away from the ports. This overall additional vessel activity is expected to result in very low impacts at the Los Angeles-Long Beach ports. This impact level is defined as "little or no expansion of existing facilities would be required."

ii. Conclusion: Impacts to ports and harbors in Central California and the Santa Barbara Channel would not significantly differ from those described for the original proposal (high to Port San Luis or an alternative site that is approved by state and local planning Jurisdiction) (Alternative I). Very low impacts are expected on the Ports of Los Angeles-Long Beach. There were no expected impacts to these ports in the original proposal (Alternative I).

l. Impact on Marine Traffic

i. Discussion. The total tankering scenario would generate a total of 141 round trips by 27,000 DWT tankers from the sale area (see Table IV.N-1) to ports in San Francisco, Los Angeles-Long Beach, and the Gulf of Mexico in the peak year of production (1993). The statistically expected number of tanker casualties is 0.012; for severe casualties, 0.003 (see Section IV.E.3.1 for definitions of these terms).

Support vessel activity (i.e., crew boats and supply boats) is the same as that described for Alternative I.

Twenty-five percent of the production would be transported to the San Francisco Bay area from the sale area. In the peak year (1993), this represents 39 round trips per year (Table IV.N-1). Currently, about ten large vessels arrive at the port daily. Thus, the proposal-generated tankering represents about one percent of the present traffic. This is the same number of tanker trips to and from the San Francisco Bay area as was predicted for the original proposal. Fifty percent of the production would be transported to the Ports of Los Angeles-Long Beach from the sale area. In the peak year (1993), this represents 78 total round trips by 27,000 DWT tankers (Table IV.N-1). It is assumed that these tankers will follow the vessel traffic lanes through the Santa Barbara Channel to the Ports. Presently, about 26 large vessels pass through the Channel (in both directions). Thus, the proposal-generated tankering represents about one percent of the present traffic. About 20 large vessels currently arrive at the Ports of Los Angeles-Long Beach. The proposal-generated tankering represents about one percent of this traffic.

Twenty-five percent of the production would be transported to the Gulf of Mexico from the sale area. In the peak year of production (1993), this represents 39 round trips per year (Table IV.N-1). It is assumed that this vessel traffic would take a route south of the Channel Islands in transit to the Gulf. This low volume of additional marine traffic is expected to result in low impacts to marine traffic that transits south of the Channel Islands on route to the Gulf of Mexico. These impacts would be in addition to those described in Section IV.E.3.1.

Since the all tankering scenario does not generate more than a one percent increase in marine traffic in Central or Southern California, then the expected impacts on marine traffic would not differ significantly from those described in Section IV.E.3.1.

ii. Conclusion. Expected impacts on marine traffic are not expected to differ significantly from those described for the original proposal, except that there would also be low impacts on marine traffic that transits south of the Channel Islands on route to the Gulf of Mexico. Overall, impacts to marine traffic remain low.

m. Impact on Refineries

i. Discussion: Impacts to refineries are expected to remain at the same level (low) as described for the original proposal (Alternative I). The level is expected to remain the same, since the produced crude oil would be distributed to the refineries in the same proportions as in Alternative I (i.e., 25 percent to the San Francisco Bay area, 50 percent to the Greater Los Angeles area, and 25 percent to the Gulf of Mexico coast).

ii. Conclusion:

Impacts to refineries are expected to remain at the same level (low) as described for the original proposal (Alternative I).

n. Impact on Offshore Structures

i. Discussion: No impacts to existing offshore structures in the sale area are expected with the total tankering scenario, as in the original proposal (Alternative I). Support vessel activity (i.e., crew boats and supply boats) is the same as that described for Alternative I. The tankering scenario would generate a total of 78 round trips by 27,000 DWT tankers from the sale area through the Santa Barbara Channel to the Ports of Los Angeles-Long Beach in the peak year of production (1993)(Table IV.N-1). Currently, about 26 large vessels transit the Channel (both directions) each day. Thus, the proposal-generated tankering through the Channel represents less than one percent of the present traffic. Due to the slight increase in vessel traffic, impacts to offshore structures in the Channel are not expected to differ significantly from the original proposal impacts (i.e., low). No impacts to offshore structures south of the Channel are expected due to the slight, additional increase in tankering. It is assumed that the tankers would follow the obstruction-free vessel lanes in route to and from the Los Angeles-Long Beach ports.

o. Impacts on Military Uses

i. Discussion. As discussed previously (Sections III.C.15 and IV.E.3.o) the military is very active offshore Central California. The impacts to military operations from offshore oil and gas activities, result from space-use conflicts, the placement of offshore structures, vessel traffic, and cleanup activities of possible oil spills. This scenario calls for transporting all the oil found from the Proposal by tanker only (eliminating pipeline transport). This results in a maximum of an additional 78 tanker round trips per year within the sale area (during the peak production year). This is a low increase in vessel traffic. The currently proposed traffic lanes are anticipated to be formalized in the near future, alleviating the growing problem of vessel traffic between Los Angeles and San Francisco. As a result, no increased impacts to military operations are expected with the all-tankering scenario.

ii. Conclusions: The impacts to military uses are not expected to change from the proposal (high impacts expected) with this scenario. This is due to the small expected increase in tanker traffic through areas of military concern in the sale area, and the anticipated approval of the Coast Guard Proposed Traffic Lanes offshore Central California.

0. Environmental Impacts of Total Development

Section IV.E provides an analysis of impacts expected as a result of the proposal (most likely scenario). However, although unlikely, if all oil and gas resources in the proposed sale area are leased, explored and developed (total development scenario), impacts would change.

The total development scenario is based on the Conditional Mean Resource Estimate, an estimate of the total undiscovered recoverable oil and gas given that hydrocarbons are present within the proposed sale area (for a detailed description refer to Appendix I). The Conditional Mean Estimate of oil and gas to be recovered from this area is 970 million barrels of oil and 950 billion cubic feet of gas. The Conditional Mean Resource Estimate and associated exploration, development, and production (See Sections II.A.1.b,c, and d and Tables IV.0-1 and IV.0-2) provide the basis for the analysis the total development scenario. In the unlikely event that all the Conditional Mean Resources are leased, explored and developed as a result of Proposed Lease No. 73, the following impacts are expected.

1. Physical Environment

a. Impact on Water Quality

i. Discussion: The level of impacts to water quality were discussed in Section IV.E.1 for the most likely case of development. The volumes of effluents predicted for the most probable case (Table IV.A.8.a-1) and the levels of impact will also increase.

Approximately 970,000 cubic yards of sediment will be moved during pipeline burial in the estimated high case. Impacts to water quality will be from temporary localized turbidity and are expected to be very low as will the impacts from any slight mobilization of trace metals or hydrocarbons in the disturbed sediments. Approximately five times the amount of drill cuttings and drilling muds are expected to be discharged in the total development case as in the most likely case. The volume of materials discharged from the expected 30 platforms will increase the level of impact to water quality from moderate (within 300 meters of discharge) and low (within 1000 m of discharge) to high (within 300 meters of discharge for the duration of the discharge) and moderate to low (within 1000 m of discharge during discharge periods). The level of impact to water quality outside a 1000 m radius of the discharge point might also increase from very low to low for some additional unknown distance. These levels of impact are only approximate and depend on the oceanographic conditions at the time of muds and cuttings discharge. Should the 30 platforms be grouped on adjacent lease tracts, the level of impact to water quality would be greater over a wider area (moderate level over greater distance) than described above. This grouping of platforms is not expected.

An average of 200,000 barrels (8.4 million gallons) of formation water will be discharged each day in the sale area in the total development case. This estimated discharge compares in volume to the municipal sewage discharge from a city somewhat smaller than Oxnard, California (14 million gallons of municipal wastes per day). This volume of formation water is expected to result in low to very low levels of impact to water quality around the platforms. The areal extent of this impact in the sale area will depend upon oceanographic conditions promoting mixing and dilution of discharged water and the placement of the

TABLE IV. 0-1
TOTAL ESTIMATED OFFSHORE INFRASTRUCTURE
FOR THE TOTAL DEVELOPMENT SCENARIO
(CONDITIONAL MEAN)

Exploration wells	80
Delineation wells	40
Development wells	800
Platforms	30
Pipelines (miles)	506
Subsea Completions	2

TABLE IV. 0-2
OIL SPILL OCCURRENCES EXPECTED FROM
THE TOTAL DEVELOPMENT SCENARIO
(CONDITIONAL MEAN)

Spill Volume	Expected Number of Spills (% Probability of One or More Spills)
$\geq$ 1,000 bbls	3.00 (95%)*
1-10,000 bbls	1.67 (81%)
$\geq$ 10,000 bbls	1.32 (73%)

* Although three oil spills (greater than 1,000 bbls) are expected from the total development scenario, this scenario will "back-out" enough oil from Alaskan imports to decrease oil spills (greater than 1,000 bbls) from this source by one. Thus, the net increase in oil spills (greater than 1,000 bbls) from the total development scenario will be two (see Section IV.A.4.a).

30 platforms. It is expected that 94 square kilometers will experience low to very low levels of impact to water quality from formation water discharge. On a sale area wide basis, this impact level will be minimal.

Three spills larger than 1000 barrels volume are expected in the proposed sale area under the total development case. Impacts to water quality from the spills are expected to be moderate (increase in hydrocarbons 2-3 orders of magnitude above ambient levels). There is about a 14 percent probability of an oil spill hitting the Morro Bay area. Should this occur and spilled oil enter the estuary there, the level of impact to water quality would be very high in the shallow depths in the bay and estuary. This is not expected because protective booming would be used to protect the bay and estuary.

ii. Conclusions: Water quality in the immediate vicinity of platforms and pipeline burials will be degraded by routine discharges, emplacement activities, and accidental oil spills. The level of expected impacts to water quality in the total development case will range from moderate to very low (see definitions of impact levels in Appendix A).

iii. Cumulative Impacts: The cumulative impacts to water quality will be as described in Section IV.E.1 for the most likely case of development. In addition to the cumulative volumes of routine effluents (indicated in Table IV.E.1.a-4), there will be nine (9) oil spills expected from existing and proposed activities. The impacts to water quality from these spills will be as described in Section IV.E.1, moderate impact.

b. Impact on Ocean Dumping

i. Discussion: A detailed description of the impacting agents to ocean dumping in Central California are described in Section IV.E.1.b. Bottom disturbing activities are the main impact producing agent to dump sites. There is a potential that 30 platforms, 920 wells, and 506 miles of pipeline could occur as a result of the sale. As the positions of the dump sites are known, the probability of one or more of these disturbances contacting a dump site would be low.

If the hazardous waste dump site, located 56 miles off Point Arguello, is contacted, a very high impact (see Appendix A for a listing of the levels of impact to ocean dumping and their definitions) is assumed. However, if the Hazardous Waste Stipulation is invoked, impacts would decrease. This stipulation requires that the surveys required by OCS Order No. 2 be used to ascertain that no hazardous waste material will be disturbed by development of the area, and that no risk to the environment will be caused by contact with the waste material. Surveys required by this Order include a hazards report and other surveys as necessary for safe exploration and development activities on the OCS. This stipulation will in effect remove the potential very high impact that is associated with the hazardous waste dump site.

ii. Conclusions: The impacts from hazardous waste dump sites could be very high if bottom disturbing activities, contact the waste containers.

iii. Cumulative Impacts: Impacts to ocean dumping in the region will occur from other projects and existing leases. The expansion at Vandenberg Air Force Base will have a need for an offshore dredge spoil site. The State Tidelands would not impact any sites since designated sites are not located in the planning area between Point Arguello and Point Conception. The existing leases in southern Santa Maria Basin are expected to have a very low impact to the dump sites in the area. The proposal does not significantly add to the impacts from these sources unless the hazardous waste site off Point Arguello is contacted.

c. Impact on Air Quality

i. Discussion: No detailed air quality analysis was performed for the total development scenario. Impacts on air quality were estimated using the California OCS air quality handbook (FSI, 1983a). For a discussion of specific air quality models and technical assumptions used, refer to Section IV.E.1.c.

Inert Pollutants. The total development scenario would result in overall air emissions approximaly three times as long as those associated with the most likely scenario (maximum annual emissions for the most likely scenario are given in Table IV.A.8-1). During the peak development year (1989) air emissions would result from 3 exploration and delineation wells drilled, 124 development wells drilled, 6 platforms installed, and 48 miles of pipeline laid. There would be 7 platforms in production, with an annual production of 34.9 million barrels of oil and 34.2 billion cubic feet of gas (Table II.A.1.c-1). During the peak production year (1993) there would be 26 platforms in production, 2 platforms installed, 91 develpment wells drilled, and 16 miles of pipeline laid. Total annual production would be 90.5 miliion barrels of oil and 88.6 billion cubic feet of gas (Table II.A.1.c-1).

Preliminary estimates performed by MMS using the OCS air quality handbook (FSI, 1983a) indicated that in the peak production year, the maximum annual average onshore NO_x concentrations would exceed the DOI Significant Levels of 1 ug/m^3. It was also estimated that no single platform by itself would cause an exceedance of the DOI Significance Levels. However, best available control technology (BACT) would likely be required on some sources under the cumulative provision of the DOI air quality regulations (30 CFR 250.57-1(j)). DOI air quality rules are presented in Appendix H. Potential mitigating measures are discussed in Appendix O.

Maximum onshore conceentrations of SO_2, CO, and TSP would be below the DOI Significance Levels (the DOI Significance Levels are presented in Section IV.E.1.c and also in Appendix H).

Onshore gas processing facilities would also be a source of air pollutants, primarily NO_x. Air quality impacts would be unknown as they would depend on plant location and emission controls required. Emissions would be regulated by the local air pollution control agency.

Existing onshore background levels in the proposed lease sale area for all inert pollutants, except TSP, are below ambient air quality standards. Proposed Sale No. 73 activities would contribute insignificantly to existing pollution levels after application of BACT to NO_x sourcess. Air quality impacts would be very low to low (see definition in Appendix A).

Ozone. Trajectory models to compute ozone levels were run with trajectory end-points at Nipomo and Santa Ynez. In both cases, the trajectories passed over 3 platforms with a combined oil production of 54,000 bcd. All 3 platforms were placed at one location to maximize calculated impacts. The Nipomo trajectory resulted in a maximum 1-hour average ozone increase of 4 parts per hundred million (pphm). The maximum baseline concentration (without OCS platform emissions) was 12 pphm. Since the Federal AAQS for ozone is 12 pphm, any increase above the baseline concentration would result in a violation of the Federal standard. The Santa Ynez trajectory resulted in a maximum 1-hour average ozone increase of 1 pphm. The maximum baseline concentration was 10 pphm. Since the State AAQS for ozone is 10 pphm, the increase in ozone would cause a violation of the State standard, but not of the Federal standard.

If an OCS source were to cause a violation of the ambient air quality standard, OCS operators would be required to fully reduce emissions through emission controls and/or emission offsets (see Appendix H).

Air quality impact from O_3 would be moderate due to the potential to exceed the federal standard (see definition in Appendix A).

ii. Conclusions: The development of oil and gas resources for the conditional mean estimates would cause moderate air quality impacts to San Luis Obispo and Santa Barbara Counties due to a potential increase in ozone levels.

iii. Cumulative Impacts: Cumulative air quality impacts were estimated using the California OCS air quality handbook (FSI, 1983a). For a discussion of the approach used in estimating cumulative air quality impacts refer to Section IV.E.1.c.

Inert Pollutants Preliminary estimates performed by MMS using the OCS air quality handbook (FSI, 1983a) indicated that the maximum annual average onshore NO_x concentrations would exceed the DOI Significance Levels of 1 ug/m^3. It was also estimated that no single platform by itself would cause an exceedance of the DOI Significance Levels. However, best available control technology (BACT) would likely be required on some sources under the cumulative provision of the DOI air quality rules are presented in Appendix H. Potential mitigating measures are discussed in Appendix O.

Maximum onshore concentrations for SO_2, CO, and TSP would be below the DOI Significance Levels (the DOI Significance Levels are presented in Section IV.E.1.c and also in Appendix H).

Table IV.O.1.c-1 shows maximum predicted cumulative concentrations of inert pollutions. It is assumed that maximum annual average NO_X concentrations from OCS sources would not exceed DOI Significance Levels as BACT would be applied to reduce potential NO_X emissions.

Existing onshore background levels in the proposed lease sale area for all inert pollutants, except TSP, are below ambient air quality standards. Proposed Sale No. 73 activities would contribute insignificantly to existing pollution levels after application of BACT to NO_X sources. Air quality impacts would be very low to low (see definition in Appendix A).

Ozone. Trajectory models to compute ozone levels were run with trajectory end-points at Nipomo and Santa Ynez. In both cases, the trajectories passed over 3 platforms with a combined oil production of 54,000 bcd. All 3 platforms were placed at one location to maximize calculated impacts. The Nipomo trajectory resulted in a maximum 1-hour average ozone increase a 4 parts per hundred million (pphm). The maximum baseline concentration (without OCS platform emissions) was 12 pphm. Since the Federal AAQS for ozone is 12 pphm, any increase above the baseline concentration would result in a violation of the Federal standard. The Santa Ynez trajectory resulted in a maximum 1-hour average ozone increase of 1 pphm. The maximum baseline concentration was 10 pphm. Since the State AAQS for ozone is 10 pphm, the increase in ozone would cause a violation of the State standard, but not of the Federal standard.

If an OCS source were to cause a violation of the ambient air quality standard, OCS operators would be required to fully reduce emissions through emission controls and/or emission offsets (see Appendix H.) Potential mitigating measures are presented in Appendix O.

Overall, air quality impacts would be moderate due to the potential of O_3 levels exceeding national standards (see definition in Appendix A).

2. Biological Environment

a. Impact on Intertidal Benthos

i. Discussion: The level of impacts and the mechanisms of impacts to intertidal benthos are discussed in Section IV.E.2.a for the most likely case of development.

TABLE IV.0.1.c-I

MAXIMUM PREDICTED ONSHORE CUMULATIVE POLLUTANT CONCENTRATIONS[1]

	Pollutant Concentration (ug/m^3)									
	NO_x		SO_2				CO		TSP	
Averaging Time	1-hr	Annual Avg.	1-hr	3-hr	24-hr	Annual Avg.	1-hr	8-hr	24-hr	Annual Avg.
Maximum Predicted Concentrations (OCS sources only)										
San Luis Obispo County	235	1	<25	<25	<5	<1	<2,000	<500	<5	<1
Santa Barbara County	160	1	<25	<25	<5	<1	<2,000	<500	<5	<1
DOI Significance Level	-	1	-	25	5	1	2,000	500	5	1
Maximum Background Concentrations (without OCS sources)										
San Luis Obispo County	206[3]	13[4]	209[4]	N/A[5]	63[4]	3[4]	11,429[3]	7,500[3]	102[4]	58
Santa Barbara County	75[6]	17[7]	104[7]	N/A[5]	31[7]	3[7]	17,142[8]	9,900[8]	121[7]	63
Maximum Predicted Concentrations (background concentrations added to cumulative OCS concentrations)										
San Luis Obispo County	441[9]	14	<234	N/A[5]	<68	<4	<13,429	<8,000	<107	<59
Santa Barbara County	235[9]	18	<129	N/A[5]	<36	<4	<19,142	<10,400	<126	<64
National AAQS	-	100	-	1300	365	80	40,000	10,000	260/150[2]	75/60[2]
California AAQS	470	-	1310	-	131	-	23,000	10,000	100	60

Source: POCS Technical Paper No. 83-2 (FSI, 1983b)

1. Annual average concentrations are for the peak production year (1993).
2. National Primary/National Secondary Standard.
3. Recorded at San Luis Obispo.
4. Recorded at Morro Bay.
5. N/A indicates monitoring data for this averaging period were not available.
6. Recorded at Santa Maria.
7. Recorded at Lompoc.
8. Recorded at Santa Barbara.
9. Based on the assumption that all NO_x would be in the form of NO_2.

Possible impacts are from oil spills and pipeline construction. As with the most likely case of development, no oil spills are expected to reach intertidal habitats within the proposed sale area and, therefore, no impacts are expected to intertidal benthos from total development. There is no change in pipeline routes to shore. Moderate impact (1 significant interference with ecological relationships lasting less than 2 years) to intertidal communities within the 20 meter path of pipeline construction and possibly high (a significant interference with ecological relationships lasting for over 2 years) impact to some endemic Nipomo Dune dune species would be expected.

The northern shore of San Miguel Island has a 40 percent probability of being hit by a large oil spill within 30 days. The expected impact to intertidal communities from this spill is moderate (a significant interference with ecological relationships lasting less than 2 years) although a high impact is possible.

ii. Conclusions: No impacts to intertidal benthic communities are expected to occur from oil spills within the sale area. Pipelines crossing Nipomo Dunes could cause moderate or possibly high impacts to endemic dune species. Moderate (a significant interference with ecological relationships lasting less than 2 years) impacts are expected to occur to the intertidal communities of the northern shore of San Miguel Island as a result of a large oil spill.

iii. Cumulative Impacts: Additional cumulative impacts in the Santa Maria Basin on intertidal areas could come from: 1) State of California leases in Southern California and proposed activities in the Point Arguello/Point Conception area; 2) OCS Sales No. 35, 48, 53, RS-2, and 68; 3) possible additional sewage facilities from the expansion of Vandenberg Air Force Base; 4) vessel accidents; and 5) visitor use of the beaches. These impacts should be localized and generally moderate.

Of particular concern to the intertidal areas may be visitor use for food gathering and walking on sensitive intertidal areas. California Department of Fish and Game (Frey, 1971) regards visitor use as one of the most detrimental impacts to intertidal areas.

There will be an increase in oil spills coming from proposed existing development, tankering imports and an unknown number from State tidelands. The sensitive intertidal area between Point Reyes and Point Conception having a 3-day hit probability of over 25 percent is the Agate Beach/Duxbury Reef where impacts are expected to be moderate to high. Sensitive areas having a 10 to 30 day hit probability of over 25 percent are Point Reyes Headlands, James Fitzgerald Marine Reserve, Ano Nuevo Island, and the Point Arguello/Point Conception area. The impacts to these areas caused by a large oil spill would be moderate or possibly high.

The regional impacts to rocky intertidal communities in Santa Maria Basin from Federal development when coupled with State development could be moderate.

In Southern California, the mainland coast from Point Conception to just west of Mugu Lagoon has a hit probability of over 25 percent within 10 days. The expected impacts to the intertidal of this area is moderate. The northern shores of San Miguel, Santa Rosa and Santa Cruz Islands have a hit probability of over 10 percent within 10 days. The expected impacts to these intertidal areas are moderate to high (Santa Rosa Island).

b. Impact on Subtidal Benthos

i. Discussion: The level and mechanisms of impacts are discussed in Section IV.E.2.b for the most likely case of development.

Impacts will be caused by platforms, drilling muds and cuttings, and pipelines. Possible impacts will be caused by oil spills.

In the total development scenario, there are an expected 800 development wells from 30 production platforms within the sale area. As with the most likely case of development, expected impacts in the immediate vicinity of the platforms are expected to be moderate (a significant interference with ecological relationships lasting for less than 2 years) for soft bottoms and moderate to high (a significant interference with ecological relationships lasting for two or more years) to hard bottoms. Regional impacts are expected to be low. If platforms are concentrated on a hard bottom area, the entire hard bottom area could be altered resulting in a high impact to the area and possibly significant (moderate) to the region. See Section IV.E.2.b.

Impacts from pipeline construction are expected to be low for soft bottom communities and moderate to high for hard bottom communities around the pipelines (Section IV.E.2.b). Regional impacts are expected to be low.

Impacts from large oil spills are expected to be low. However, there is a possibility of high impacts to hard bottom areas (see Section IV.E.2.b). Regional impacts are expected to be low.

ii. Conclusions: Impacts from production platforms and drilling muds and cuttings are expected to be moderate (a significant interference with ecological relationships lasting less than 2 years) to high (a significant interference with ecological relationships lasting two or more years) for bottom communities in the immediate area of the platforms. Impacts from pipelines are expected to be low (an insignificant interference with ecological relationships lasting less than a year) to soft bottom communities and moderate to high for hard bottoms along the pipeline.

Regional impacts are expected to be low for all impacts except for possible moderate impacts to hard bottoms resulting from platforms and related drilling.

Impacts from oil spills are expected to be low.

iii. Cumulative Impacts: Additional cumulative impacts in the Santa Maria Basin on subtidal benthic communities could come from: 1) State of California leases in Southern California and proposed activities in the Point Arguello/Point Conception area; 2) California OCS Sales No. 35, 48, 53, RS-2 and 68; 3) vessel accidents; 4) possible sewage facilities at Vandenberg Air Force Base; and 5) other pollution sources. These impacts should be localized and generally low and moderate.

With the addition of 30 production platforms and related drilling activities from 800 development wells to the area having potential present or future heavy oil development, the likelihood of moderate regional impacts is increased. Especially probable is construction of concentrated production platforms on or very near several hard bottom areas. If this occurs, regional moderate impacts to hard bottom benthos is likely.

Local and regional impacts from pipelines and oil spills probably will remain the same as discussed above, but the chance of significant impacts to benthic communities from oil spills would be increased by an unpredictable amount.

c. Impact on Fish Resources

i. Discussion: Section IV.E.2.c provides a general discussion of potential impacts on fish resources and an analysis of the impacts expected as a result of the proposal. However, in the unlikely case that all oil and gas resources in the proposed sale area are leased, explored and developed, 3 large oil spills, 30 platforms, 2 subsea completions, 506 miles of pipeline, and 920 exploration, delineation and development wells are estimated to be needed.

Oil spills from this activity are expected to contact the northern half of San Miguel Island (see Section IV.A.4.a). Therefore, it is likely that a large school of anchovies and a large concentration of squid in this area will be contacted, and that northern anchovies and squid will sustain small 1-2 year reductions in their population sizes (see discussion in Section IV.E.2.c). Little, if any, reduction in salmon or Pacific herring populations is expected since: 1) the probability that a large oil spill will occur and contact the areas near the mouths of rivers where salmon concentrate is very low, even after 30 days (e.g., 1 percent San Francisco Bay, 2 percent San Lorenzo River); and 2) the probability that a large oil spill will occur and contact Pacific herring spawning grounds is very low even after 30 days (e.g., 1 percent San Francisco Bay, 2 percent Monterey Bay).

Manmade structures from total development of oil and gas resources in the proposed sale area are expected to cause a small decrease to Petrale sole (particularly if all resources are developed together) since it is likely that a large number of structures will be placed in the Petrale sole spawning grounds located south of Point Buchon and offshore Point Sal (see Section IV.E.2.c). At the same time, these structures are expected to cause a small increase in fish populations by: 1) acting as artificial reefs (e.g., increasing rockfish populations); 2) being used for mariculture operations (e.g., for growth of mussels); and 3) causing adverse impacts to commercial and sportfishing operations (e.g., commercial trawl fishing for bottom fish).

Effluents and discharges from the 920 exploration, delineation and development wells expected to be drilled in the proposed sale area could cause sublethal or lethal impacts to a few fish concentrated near each drilling site (see discussion in Section IV.E.2.c). However, it is unlikely that enough wells would be drilled near any one fish species to cause a significant decline. Therefore, no significant decrease in fish populations due to effluents and discharges is expected.

Noise from geophysical vessels is expected to harm or frighten some fish in the proposed sale area, resulting in a small decrease in fish populations for at least 4-6 years, since it is likely that a very large number of geophysical vessels could be used at one time if all oil and gas resources are developed together (see discussion in Section IV.E.2.c).

As a result of all proposed activities discussed above, northern anchovy and squid populations near San Miguel Island are expected to sustain small 1-2 year reductions, the Petrale sole population near Point Sal is expected to sustain a small reduction while manmade structures are in place, and fish populations that are concentrated near geophysical vessel operations are expected to sustain small reductions for at least 4-6 years. Overall, the expected regional impacts are low since impacts will be small, restricted to a few species and restricted to localized areas.

ii. Conclusions: Leasing, exploration and development of all oil and gas resources in the proposed sale area are expected to result in a small 1-2 year reduction in northern anchovy and squid populations near San Miguel Island, a small reduction in the Petrale sole population near Point Sal while manmade structures are in place, and a small decrease for at least 4-6 years in fish populations that are concentrated near wells or geophysical vessel operations. Overall, the expected regional impacts on fish resources are low (a small reduction in the population sizes of a few species).

iii. Cumulative Impacts: Without the proposal, fish populations are expected to sustain large to very large decreases due to fishing pressure, sewage disposal, natural oil seeps, existing and proposed offshore oil and gas leases (State and Federal), tanker transportation of foreign and Alaskan crude oil impacts, and other vessel traffic (see discussion in Section IV.E.2.c.iii). The proposal (total development scenario) is expected to slightly decrease the volume of Alaskan crude oil imports and, therefore, the number of oil spills from Alaskan imports (see Section IV.A.4.a). However, the proposal (total development scenario) also is expected to result in a significant (small) decrease in a few fish populations as discussed above. The total cumulative impact of the proposal (total development scenario) and other activities is expected to result in essentially the same total impact on fish resources as would occur without the proposal. That is, fish resources are expected to sustain large to very large decreases.

d. Impacts to Marine Mammals

i. Discussion: Impacts to marine mammals under the "total development" scenario are essentially the same as those discussed under the "most likely" volume scenario (IV.E.2.d). Impacts to the northern fur seal are expected to be high if a spill occurs during pupping or breeding season. However, impacts to all other species are expected to be low. Impact agents of concern are oil spills and noise and disruption. See Section IV.E.2.d for a discussion of impacts.

Three spills are expected to occur under the "most likely" scenario. However, only one spill is expected to contact the 6-mile buffer zone around the northern Channel Islands. No spills are expected to contact the remainder of the coast. The most likely area for contact in the Channel Islands is the northern side of San Miguel. Should the spill occur during pupping or breeding season (May to August), impacts to the northern fur seal would likely be high (high mortality to the California population requiring 1 to 2 decades for recovery).

The two spills that occur and remain at sea may cause some mortality to northern fur seals from the Pribilof Islands (in Alaska) or small cetaceans. Estimated impacts are low, however. Impacts may increase to moderate if the cumulative mortalities require more than 1 to 3 years for recovery. (See Appendix A for definitions of impacts.)

The 30 platforms from the Proposal and additional seismic work will increase noise levels. This increase in noise and disturbance from boats, aircraft, platforms and seismic activity is likely to increase the impacts to marine mammals slightly. Endangered whales and discussed under Section IV.O.2.f. Overall, the noise and disturbance impacts remain low for non-endangered marine mammals.

ii. Conclusions: Impacts to the northern fur seals are expected to be high (requiring 1 to 2 decades for recovery) if a spill occurs during the pupping or breeding season. Impacts to all other species, seals, sea lions, porpoises and dolphins are expected to be low.

iii. Cumulative Impacts: With the exception of impacts from platforms and an expected oil contact between Pt. Arguello and Pt. Conception, the cumulative impacts will be the same as those discussed in Section IV.E.2.d since the number of oil spills and contact areas are the same.

Eighty-nine platforms are projected for the Central and Southern California coast (32 in the Santa Barbara Channel, 11 in the remainder of Southern California and 46 in Central California) as a result of existing state and federal leases, and the "total development" scenario of the Proposal.

This degree of activity with attendant noise and disruptions from boats, aircraft, platform and seismic activity is likely to cause disruption to pinniped populations in the northern Channel Islands resulting in a moderate reduction in reproduction lasting the life of the Proposal. Harbor seals along the coast are also likely to experience a decrease in population numbers over the life of the Proposal. Activities from the total development scenario will contribute the majority of these impacts.

The oil spill estimated to contact the area between Pt. Arguello and Pt. Conception will have very low impacts on the California harbor seal population. The population is relatively small and mortality should be low.

In conclusion cumulative impacts to marine mammals are likely to be very high due to repeated high mortality to northern fur seals requiring decades for recovery. Impacts due to reproductive losses or mortality of other species will be moderate to high and require a few years to 1 to 2 decades for recovery. Impacts caused by the "most likely" scenario of the Proposal will probably add a large amount to the cumulative impacts due to the estimated impacts to the northern fur seal from an oil spill and the 30 platforms. Noise and disturbance from Proposal platforms, boats, aircraft, etc., will contribute a moderate amount to the impacts from these sources.

e. Impacts on Seabirds

i. Discussion: See Section IV.E.2.e for a discussion of impact agents. Impacts are expected to be low to moderate (mortality of California population of one or more species requiring a few to 10 years for recovery) due to an oil spill contacting the northern Channel Islands.

Impacts to seabirds in other areas of the State are expected to be low to moderate due to 3 spills estimated to occur and the resultant at sea mortality to seabirds. Impact agents of concern are oil spills, noise and disruption.

The oil spill model (OSRAM) predicts three large spills (greater than 1,000 bbl based on the "total development" scenario). However, only one of these spills is expected to contact significant seabird nesting or feeding areas. The one oil spill is expected to contact the 6-mile buffer zone surrounding the northern Channel Islands. No spills are expected to contact the remainder of the coast. The most likely area for contact in the Channel Islands is the northern side of San Miguel. Ashey storm petrels and Cassin's auklet nest on Castle Rock and Prince Island nearby. Impacts would likely be moderate during nesting season (February-November) due to mortality of a large portion of the colonies.

Should one or more of the large spills contact concentrations of sensitive migrant birds such as loons, grebes and ducks, a low impact mortality of the California population with recovery requiring a few years is most likely. As discussed in Section IV.E.2.e, the locations and timing of these concentrations of birds is largely unpredictable. However, the accumulated effects of the 3 spills will probably increase the impact level to moderate, i.e., up to 10 years' recovery time.

The 30 platforms and attendant noise and disruption are not expected to significantly impact seabirds since there are no colonies of special concern in the Proposed Lease Area (see Table IV.E.2.e for a tabulation of sensitive colonies and potential impacts) and platforms should not significantly disrupt migrants.

ii. Conclusions: Impacts to the California nesting seabird population are expected to be low to moderate (mortality of the California population of a species requiring a few to 10 years for recovery) due to an oil spill expected to contact the buffer zone around the northern Channel Islands. Impacts to other seabirds are expected to be moderate from oil spills and other sources.

iii. Cumulative Impacts: Cumulative impacts will be essentially the same as those discussed in Section IV.E.2.e. That is, impacts to nesting seabirds are likely to be moderate due to high mortality of 15 percent of the California auklets requiring 10 years for recovery. Impacts to other seabirds will probably be moderate requiring a few to 10 years for population recovery. The Proposal (total development scenario) is expected to contribute a large amount to the cumulative impacts.

f. Impacts on Endangered and Threatened Species

i. Discussion: Impacts on endangered and threatened species are essentially the same as those discussed in the most likely scenario. Impact agents of concern are oil spills, and noise and disruption. See Section IV.E.2.f. for a discussion of impacts.

One oil spill is expected to occur and contact the 6-mile buffer around the northern Channel Islands. No spills are expected to contact the remainder of the coast. The most likely area for contact to the Channel Islands buffer zone is the western end (near San Miguel Island). No endangered or threatened species utilize this area in significant numbers. Therefore, the most likely impacts from an oil spill would be low. However, should a spill occur and contact the more sensitive habitats of any protected species, impacts would be higher (See Section IV.E.2.f).

The 30 platforms and anticipated level of seismic activity will increase noise levels for gray whales and sea otters. This level of increase will likely result in a small increase in mortality. These impacts may last for the life of the Proposal (See Section IV.E.2.d. and f). Impact levels will remain low.

The 30 platforms are likely to contribute significant motivation for the proposed El Estero, Baja California, platform fabrication plant. This plant is likely to cause very high impacts to light-footed clapper rails due to destruction of nesting habitat of 25 percent fo the subspecies. Recovery would likely require decades, or may never occur at all.

ii. Conclusions: Impacts to light-footed clapper rails are likely to be very high and require decades for recovery, if possible. at all. Impacts to other species are likely to be low. In the case of sea otters and gray whales these low level impacts would probably last for the life of the Proposal.

iii. Cumulative Impacts: With the exception of impacts from platforms the cumulative impacts will be the same as those discussed in IV.E.2.f. Oil spills and contact areas are essentially the same. Eighty-nine platforms are projected for the Central and Southern California coast: 32 for Santa Barbara Channel, and 46 for Central California. These are the result of existing State and Federal leases and the total development from the Proposal.

This degree of activity with attendant noise and disruption from boats, aircraft, platforms and seismic activity, is likely to cause disruption to brown pelicans, sea otters, and gray whales. This would result in small population reductions. These low to moderate impacts may last for the life of the Proposal. See Section IV.E.2.d and f for details on the effects of noise and oil on gray whales.

The addition of low impacts from noise and high impacts from oil spills will likely result in very high impacts to brown pelicans. The 89 platforms further increase the likelihood of very high impacts to light-footed clapper rails. (See Section IV.E.2.f.)

In conclusion, cumulative impacts to known pelicans and light-footed clapper rails are likely to be very high, recovery requiring decades. Impacts to sea otters and gray whales are likely to be low, lasting the duration of the Proposal. The Proposal contributes about one third of these impacts.

g. Impacts on Estuaries and Wetlands

i. Discussion: The level of and mechanisms of impacts to estuaries and wetlands are discussed in Section IV.E.2.g for the most likely case of development. Possible impacts could occur as a result of oil spills. As with the most likely case of development, no oil spills are expected to reach an estuary within either the sale area or Southern California. Therefore, no impacts are expected to estuaries from total development.

ii. Conclusion: No impacts to estuaries and wetlands are expected to occur from oil spills within the sale area or Southern California.

iii. Cumulative Impacts: Additional cumulative impacts in the Santa Maria Basin on estuaries could come from: 1) State of California leases in Southern California and proposed activites in the Point Arguello/ Point Conception area; 2) California OCS Sales No. 35, 48, 53, RS-2, and 68; 3) possible additional sewage facilities from the expansion of Vandenberg Air Force Base; and 4) vessel accidents. Impacts to estuaries within the proposed sale area should remain very low overall with localized low and moderate impacts.

There will be an increase in oil spills resulting from proposed existing development, tankering imports of Alaskan and foreign oil and an unknown number from the State tidelands development. Estuaries in Bodega and Santa Cruz Basins that have hit probabilities of over 25 percent include Drakes-Limantour Estero, Bolinas Lagoon, and San Francisco Bay. Estuaries within Santa Maria Basin and Southern California that have hit probabilities of over 25 percent include the Santa Ynez River, Goleta Slough, Carpinteria Marsh and Santa Clara River. These estuaries are expected to receive a large oil spill, although oil may not enter those in Southern California because of their small openings. The expected impacts to these estuaries should oil enter would be high except for San Francisco Bay, where impacts would be localized and moderate.

h. Impacts on Areas of Special Concern

i. Discussion: The level and mechanisms of impacts to areas of special concern are discussed in Section IV.E.2.h for the most likely case of development.

Possible impacts would be caused from oil spills. As with the most likely case of development, no oil spills are expected to reach areas of special concern within the sale area and, therefore, no impacts are expected to areas of special concern from total development.

The northern shores of San Miguel Island (an area of special significance ASBS) has a 40 percent probability of being hit with a large oil spill within 30 days and consequently is expected to be impacted. The expected impact to the intertidal communities of San Miguel Island is moderate (a significant interference with ecological relationships lasting less than 2 years). Impacts on sensitive seabirds and marine mammals are discussed in Sections IV.I.2.d and e.

ii. Conclusions: No impacts to areas of special concern are expected to occur from oil spills within the sale area. Moderate (a significant interference with ecological relationships lasting less than 2 years) impacts are expected to occur to the intertidal communities of the northern shore of San Miguel Island as a result of a large oil spill. The sensitive seabirds and marine mammals on San Miguel Island are discussed in Sections IV.I.2.d and e.

iii. Cumulative Impacts: Additional cumulative impacts in the Santa Maria Basin on intertidal areas could come from: 1) State of California leases in Southern California and proposed activities in the Point Arguello/Point Conception area; 2) California OCS Sales No. 35, 48, 53, RS-2 and 68; 3) vessel accidents; 4) visitor use of the beaches; and 5) possible sewage facilities at Vandenberg Air Force Base.

Although there will be an increase in the number of oil spills coming from proposed and existing development and tankering imports, no spills are expected to reach any areas of special concern within the sale area.

Areas of special significance outside the proposed sale area having oil hit probabilites over 25 percent include Double Point, Point Reyes, Headland Reserve, Duxbury Reef Reserve, Ano Nuevo Reserve and the southern portion of the sea otter range. Impacts from a large oil spill to the intertidal communities of these areas would range from low (an insignificant interference with ecological relationships requiring less than a year to recover) to moderate and possibly high (a significant interference with ecological relationships requiring at least 2 years to recovery), particularly at Duxbury Reef.

In Southern California, the northern shores of San Miguel, Santa Rosa and Santa Cruz Islands (all of which are ASBS) have oil spill hit probabilities over 25 percent and are consequently expected to be hit. Expected impacts to the intertidal communities of these islands are expected to be moderate, although high impacts, particularly at Santa Rosa Island, are possible.

Impacts to seabirds and marine mammals are discussed in Sections IV.I.2.d and e.

i. Impacts on Marine Sanctuaries

i. Discussion: The levels and mechanisms of impacts to the Marine Sanctuaries are discussed in Section IV.E.2.i for the most likely case of development. Possible impacts would be caused from oil spills. Oil spills are not expected to reach the Point Reyes/Farallon Islands National Marine Sanctuary or Point Reyes Wilderness Area and, therefore, no impacts are expected to occur.

According to the oil spill model, the Channel Islands National Marine Sanctuary in Southern California, has a 10- and 30-day oil spill hit probability of 46 and 66 percent, respectively. Only the northern shores of San Miguel Island (actually part of the National Park) has a hit probability of over 25 prcent (40 percent probability of a hit within 30 days).

Moderate impacts (a significant interference with ecological relationships requiring less than 2 years to recover) are consequently expected for intertidal benthos. Impacts on marine mammals are discussed in Section IV.I.2.e.

ii. Conclusions: No impacts are expected for the Point Reyes/Farallon Islands National Marine Sanctuary or Point Reyes Wilderness Area. Moderate impacts (a significant interference with ecological relationships lasting less than 2 years) are expected to the intertidal benthos on the northern shores of San Miguel Island.

iii. Cumulative Impacts: The cumulative impacts in Central California are caused by tankering and domestic and industrial effluents which come primarily from San Francisco Bay. In Southern California, cumulative impacts are caused by previous OCS oil and gas leases, tankering, and State of California leases and proposed activities in the Point Arguello/Point Conception area. The large oil spill 3-day high probability for the Point Reyes/Farallon Island and Point Reyes Wilderness Area is 55 and 66 percent.

Further, there is an expected oil spill hit for the shores of the Point Reyes Headlands. Impacts to intertidal communities in the headlands are expected to be moderate (a significant interference with ecological relationships lasting less than 2 years). Impacts to the Drakes-Limantour Estero would probably be high (a significant interference with ecological relationships lasting over 2 years). Impacts to marine mammals and seabirds will be the same as discussed above in Section IV.I.2.d and e.

The probability for the Northern Channel Islands Marine Sanctuary of being hit with a large oil spill within 30 days is 97 percent. The northern shores of San Miguel, Santa Rosa and Santa Cruz Islands National Park are expected to be contacted by a large oil spill. Expected impacts to intertidal benthos, marine mammals and seabirds are the same as discussed above and in Sections IV.I.2.d and e.

3. Socioeconomic Environment

a. Impact on Coastal Economy

i. Discussion: Chapter IV.E.3.a described the methods used for determining the impacts on coastal economy from OCS development. The total development scenario will result in an increase of employment by 10,140 jobs during the peak year (1990). The permanent increase in jobs over the base year (2010) employment level is an additional 2,492 jobs. The respective increases in jobs are 4.44 percent and 0.87 percent for the years 1990 and 2010. It is expected that 3,300 of the peak year jobs, and 1,100 of the permanent jobs will be filled by people in the area.

ii. Conclusions: The impacts from the total development scenario very low (a change of less than one percent).

iii. Cumulative Impacts: Increases in employment from Proposed Sale No. 73, previous Federal OCS Sales, and other projects described in Section IV.D, is the addition of 13,342 jobs. Federal OCS development is expected to account for 35.5 percent of the additional jobs. The overall increase in employment as a result of Proposed Sale No. 73, previous Federal OCS leasing and other projects is 4.7 percent of the 2010 employment level. The impact expected is considered to be moderate (a change between 3 and 5 percent). The impact from Federal OCS development is very low (a change of less than one percent).

b. Impact on Demography

i. Discussion: Chapter IV.E.3.b describes the method used to determine the change in population as a result of OCS development related to Proposed Sale No. 73. Development of the entire resources in the sale area is expected to result in a permanent increase in population of 3,828 with a peak population increase of 11,476. The peak population increase is 1.02 percent of the study area's 1990 population, and the permanent change in population is 0.26 percent of the study area's 2010 population.

ii. Conclusions: The increase in population from the total development scenario is very low (less than a one percent increase over the base).

iii. Cumulative Impacts: This proposal, previous Federal OCS leasing and other projects discussed in Section IV.D are expected to increase population by 27,795. Federal OCS development is expected to account for 8,732 people or 31.4 percent of the increase. The cumulative impact of these projects is an increase of 1.9 percent over the 2010 population. The overall cumulative impacts are low (a change between 1 and 3 percent). The cumulative impacts from Federal OCS development is very low (a change of less than one percent).

c. Public Services and Facilities

i. Discussion: Development of the Conditional Mean Resource Estimates will increase the impacts that were discussed in Section IV.E.3.c.

The demand for water for use by crew boats and supply boats, and to supply the needs of enlarged onshore facilites could result in a very high impact, significant long-term stress that may result in facility expansion, facility construction or development of a new water supply source. Continued adequate water supplies are a major concern of county and local governments in Santa Barbara and San Luis Obispo Counties. The demand for water from an energy increasing population is the main conern. OCS development of the Conditional Mean Resources would add significantly to that demand. Both San Luis Obispo and Santa Barbara Counties have entitlements to water from the State Water Project. Access to this water requires the construction of aqueducts from Kettleman City in the Central Valley to San Luis Obispo and then to Santa Barbara County. So far voters in neither county have been willing to incur the indebtness necessary to build an aqueduct. Impacts from total development and, most importantly, from general population growth may make development of the aqueduct the only viable source of adequate supplies of water.

Increased demand for wastewater treatment capacity will occur from general population growth. Increased demand from OCS related activities will add to the demands being made on existing facilities. Facilities throughout the proposed sale area should be able to accommodate OCS needs up to 1990 even under the total development scenario. In the 1990's several plants will begin experiencing capacity deficits. Any OCS demand will only add to the problem resulting in a moderate impact, some short-term stress to existing facilities.

Transportation systems will suffer moderate impacts (moderate short-term disruption of transportation patterns) from increased traffic on the roadways, rail lines, and airlines. Highway 101 would be able to accommodate increased traffic from truck transport of supplies and employees going to and from work. The road to Port San Luis would suffer significant increase in traffic resulting in long-term congestion, a localized high impact. The congestion may not be able to be alleviated because of limited room for road expansion. Increased amounts of large equipment and large amounts of supplies would be transported by rail resulting in some stress (a moderate impact) on local sidings from the congestion. Air traffic would also increase as large numbers of platform personnel commute to and from work from outside the area resulting in a short term stress or moderate impact. Power supplies would not be impaired as existing supplies are adequate to meet all onshore needs.

Impacts outside the area would occur to Santa Barbara County (channel area) and Port Hueneme. The need to supply water and have wastewater treatment capabilities (hookups) to service supply and crew boats may stress existing facilities. This could result in a high stress in both areas because of limited resource availability.

ii. Conclusions: Overall there will be a high impact to public services and facilities from the development of the Conditional Mean Resource Estimates. Impacts to water supplies may result in significant water quality deterioration from continued overdrafting. This may result in the local governments seeking other sources of water. Traffic on the road from Highway 101 to Port San Luis will be very heavy with significant congestion resulting in travel delays.

iii. Cumulative Impacts: As discussed in Section IV.E.3.c, cumulative impacts will occur with or without the development of the Conditional Mean Resources from the development of Vandenberg Air Force Base for the Space Shuttle, development of the proposed Liquidified Natural Gas facility at Point Conception, development of oil and gas facilities required from previous OCS and State Tidelands sales, and demands on facilities and services from general population increases. Development of the Conditional Mean Resources would add significantly to the demands on public services and facilities resulting in a combined very high cumulative impact or long term stress and disruption.

d. Coastal Land Use

i. Discussion: Impacts from development of the Conditional Mean Resource Estimates would magnify the impacts identified in Section IV.E.3.d, the Most Likely Development case. Thirty platforms and production of 970 mbbs of oil and 950 billion cubic feet of gas would significantly stress existing facilities. While, in most cases, there is sufficient area adjacent to existing facilities to allow for expansion, the amount needed for expansion to accommodate the Conditional Mean Resource Estimate may exceed the area presently zoned for industrial use.

At full production, the proposed crew base at Port San Luis would have to accommodate 30 crew boats and provide adequate docking or mooring space. This is in contrast to a facility capable of handling 5 crew boats per week (most likely case). This is based on the assumption of one crew boat trip per day per platform, thus requiring a dedicated vessel. Existing or assumed existing supply bases (Port Hueneme and Gaviota) would also be stressed to accommodate 60 trips per week from supply boats in addition to supply boats servicing the Santa Barbara Channel development. They would both experience pressure to expand.

Port Hueneme is limited in its ability to expand because of limited availability of land. Gaviota could expand slightly but its expansion capabilities are also limited because of conflicting land uses and zoning. This may create a demand for a new supply base to service Santa Maria Basin development. San Luis Obispo County land use policies do not allow for supply base development in the County. Santa Barbara County policies only address development of one base for Santa Maria Basin and western Santa Barbara Channel development, the assumed existing base at Gaviota. In addition, most of the coastline from Point Conception to the county line is controlled by Vandenberg Air Force Base and generally not available for non-military oriented uses.

Existing repair and maintenance facilities would experience pressure to expand but new facilities are not expected to be developed even in the total development case. Onshore processing facilities would have to be enlarged to accommodate the Mean Conditional Resource Estimate production. Their ability to expand may be limited by the generally small amounts of land zoned to accommodate energy facility expansion. Land use zone changes may be required to accommodate expansion needs.

No new pipeline or pipeline landfalls are anticipated in the total development scenario. There is no expected need for new marine terminals. The economic feasibility of establishing a platform fabrication yard on the West Coast increases with the increased number of platforms anticipated in the total Development scenario. A fabrication yard would not necessarily be built in the Santa Maria Basin and so resulting development related impacts may occur anywhere along the West Coast and even in Canada or Mexico if a yard is established there.

The increased population from OCS development would not be significant when comparing the expected population growth (refer to Section IV.I.3.c). Even so, a demand will occur for conversion to urbanized needs to provide for housing, commercial and non oil and gas industrial needs. While the demand from OCS related population would be a low impact, the demands from total population growth would be high.

ii. Conclusions: The impacts from development of the Conditional Mean Resource Estimates will result in a high impact to land use, i.e., very incompatible uses, conflicting uses, conversion of land from rural to developed, and conflicts with existing land use plans and policies. Existing county policies and plans either limit the number or size of facilities or prohibit establishment of certain facilities or of facilities in certain areas. If a platform fabrication yard is built on the West Coast, the impacts to that area would be high with incompatible land uses, conversion of land uses, and possibly conflicts with existing land use plans and policies.

iii. Cumulative Impacts: Impacts to land use, i.,e., conversions of land from rural or open space to urban, will occur regardless of the development of the oil and gas resources of the Santa Maria Basin. As discussed in IV.E.3.d, land use impacts will occur from development of Vandenberg Air Force Base for the Space Shuttle Program, development of the Liquidified Natural Gas (LNG) facility at Point Conception, the development or expansion of oil and gas facilities needed as a result of previous sales and of development of State Tidelands and the increased conversion of rural land to satisfy the need for housing from the ever increasing population (this is general growth in addition to growth associated with the above mentioned large scale projects). The development of the Conditional Mean Resources would significantly add to the impact to land use. Because of the pressure to expand existing or assumed existing facilities resulting in land use conflicts and potentially increased incompatibility of uses, the cumulative impact from this proposal when taken with impacts from other activities would be high.

e. Impact on Commercial Fisheries

i. Discussion: Section IV.E.3.e provides a general discussion of potential impacts on commercial fisheries and an analysis of the impacts expected as a result of the proposal. However, in the unlikely case that all oil and gas resources in the proposed sale area are leased, explored and developed, 3 large oil spills, 120 exploration and delineation wells, 800 development wells, 30 platforms, 2 subsea completions, and 506 miles of pipeline are estimated to be needed. A small number of temporary abandonments and debris also are expected. Tanker traffic will include a peak of 113 round trips by tankers per year between Gaviota and San Francisco, and 69 between Gaviota and the Gulf of Mexico. Supply boat, crew boat, and geophysical vessel traffic is expected to be the same per platform or well site as described in Section IV.E.3.e.

Oil spills from this activity are expected to contact the northern half of San Miguel Island (see Section IV.A.4.a). Since this is an important fishing area, fishermen are expected to sustain moderate economic losses for about one month due to tainting (or concern for tainting) and contamination of fishing gear and vessels (see discussion in Section IV.E.3.e.i).

Manmade structures are expected to result in a moderate economic loss to trawl fishermen in the proposed sale area over the life of the proposed sale since a very large number of structures are expected and these may cause fishing conflicts (see discussion in Section IV.E.3.e.i).

Vessel traffic from tankers, supply boats, crew boats, and geophysical vessels are expected to create a moderate navigation hazard to fishing, a moderate amount of gear loss primarily during years of peak activity, and small economic losses for a few days due to noise frightening fish (see discussion in Section IV.E.3.e.i).

As a result of all proposed activities discussed above, trawl fishermen in the proposed sale area are expected to sustain moderate (10 to 20 percent) economic losses over the life of the proposal primarily due to pipeline laying activities and navigation hazards. Other fishermen are expected to sustain moderate economic losses, primarily during years of peak activity, due to navigation hazards and gear loss. Since some financial loss to secondary employment (fish processing plants, etc.) is also expected, the overall regional impacts on commercial fisheries is expected to be moderate (a 10-20 percent economic loss to the industry).

ii. Conclusions: Leasing, exploration and development of all oil and gas resources in the proposed sale area are expected to result in moderate economic losses to trawl fishermen over the life of the proposal and moderate economic losses to other fishermen primarily during years of peak activity. Some financial loss to secondary employment is also expected. Overall, the expected regional impacts on commercial fisheries are moderate (10-20 percent economic loss to the industry).

iii. Cumulative Impacts: Without the proposal, commercial fishermen are expected to sustain high economic losses due to natural fluctuations in fish and shellfish populations, competition with foreign fishermen, changes in market conditions, restrictions in fish harvests, increasing fuel, labor, maintenance and vessel costs, existing and proposed offshore oil and gas leases (State and Federal), tanker transportation of foreign and Alaskan crude oil imports, and other vessel traffic (see discussion in Section IV.E.3.e.iii). The proposal (total development scenario) is expected to slightly decrease the volume of Alaskan crude oil imports and therefore, the number of oil spills from Alaskan imports (see Section IV.A.4.a). However, the proposal (total development scenario) also is expected to result in a significant (moderate) economic loss to commercial fishermen as discussed above. The total cumulative impact of the proposal (total development scenario) and other activities is expected to result in very high impacts to commercial fishermen, particularly trawl fishermen in the proposed sale area (unless other pressures are reduced). Thus, the addition of the proposal (total development scenario) is expected to increase economic losses to commercial fishermen from high to very high, particularly if all oil and gas resources are developed at the same time.

f. Impact on Sportfishing

i. Discussion: Impacts to sportfishing in Central California are described in Section IV.E.3.f. Oil spills, onshore support facilities, vessel traffic, pipelines and offshore structures are the main impacting agents to sportfishing. (The levels of impact and their definition are given in Appendix A.)

Oil Spills. Three large spills are expected to occur in the sale area as a result of the total development scenario. There is a small probability that one or more spills will strike the coast within 30 days (see Section IV.A.4).

Although unlikely, if the three spills occur within a short period of time, and all three contact the Point San Luis area, a very high impact will occur to the sportfishing industry in the sale area. This will also be the result if a contact is in the Morro Bay area. A contact by one or more spills at San Miguel Island will have a moderate impact on sportfishing.

Onshore Support Facilities. Onshore support facilities would have a low impact because of competition for available space at Port San Luis due to the anticipated berthing of crew boats at the port. Supply boats would operate out of Gaviota where there are assumed existing facilities.

Vessel Traffic. The impact to sportfishing from vessel traffic is anticipated to be very low in the sale area.

Pipelines. Two pipelines are expected as a result of the proposal. These will have a very low impact on sportfishing as the closure of part of the beach would be of short duration.

Offshore Structures. The impact from the potential 30 platforms is expected to be very low as only a very small total area would be removed from the sportfishing ground.

ii. Conclusions: The impacts to sportfishing are expected to be low. Although unlikely, one or more spills occur and contact the shore, the impact would be very high for the immediate area.

iii. Cumulative Impacts: Impacts to sportfishing would occur from various proposed projects and the existing conditions in the area. The expansion at Vandenberg Air Force Base, the Point Conception LNG Facility, the San Pedro Bay Coal Terminals, and the Port Hueneme Expansion will increase vessel traffic in the sale area. These activities have a very low impact to sportfishing. The proposed State Tidelands development would add to the vessel traffic in the area, and would also tend to remove a small area from the sportfishing grounds. Sportfishing is relatively minor in the area from Point Conception to Point Arguello; thus, a very low impact is expected in this area.

The existing leases have a low impact due to the location of the leases and the amount of development expected. These leases remove a small area from the sportfishing grounds, increase the vessel traffic in the area, and have a potential for a temporary closure of fishing in the area due to any oil spills which might occur. Regionally, the impact to sportfishing is low. The proposal does not significantly add to the impacts from these sources, unless one of the expected oil spills contacts the shoreline.

g. Impact on Recreation

i. Discussion: Impacting agents to recreation in Central California are described in Section IV.E.3.g. Oil spills, pipeline landfalls, onshore facilities, offshore structures, vessel traffic, noise and air quality are the main impacting agents to recreation. (The levels of impact and their definitions are given in Appendix A.)

Oil Spills. Three large spills are expected to occur in the sale area as a result of the total development scenario. There is a small probability that one or more spill will contact the coast within 30 days (see Section IV.A.4).

Although unlikely, the three spills occur within a short period of time and all three contact the mainland, a very high impact will occur to recreation in the sale area.

If one or more spills contact either Morro Bay or Pismo Beach area, a very high impact will occur locally and a high impact to the sale area.

If a spill contacts San Miguel Island, a low impact is expected for recreation in the sale area. If a large spill occurs and does not contact the shore, a moderate impact will result to recreation in the sale area.

Pipelines. Two pipelines are expected as a result of the proposal. These will have a very low impact on recreation as the closure of a stretch of beach would be of short duration.

Onshore Facilities. Onshore facilities are anticipated to have a low impact on recreation as they are assumed existing, or to be constructed with similar facilities.

Offshore Structures. A low impact to recreation is anticipated from the potential 30 platforms. This impact would be in the form of removing a small area from the use of recreational boaters and sportfishermen.

Vessel Traffic. The impact to recreation from vessel traffic is anticipated to be very low in the proposed sale area.

Noise. The impact of noise on recreation is anticipated to be very low for most of the life of the field. However, a moderate impact can be expected locally during periods of construction.

Air Quality. No impacts on recreation are expected because of no predicted changes in secondary effects such as orders or visibility reductions.

ii. Conclusions: The complete development is anticipated to have a moderate impact to recreation over the sale area, with very high impacts to any areas that are actually contacted by an oil spill. The exact amount of economic impact to recreation will vary for each possible contact point and time of year of contact.

iii. Cumulative Impacts: Impacts to recreation occur both offshore and onshore from other projects and existing leases. The expansion at Vandenberg Air Force Base will cause a slight increase in vessel traffic in the sale area, as will the Point Conception LNG facility. Both of these activities have a very low impact to recreation. The State Tidelands development will cause a moderate impact to recreation due to the offshore platforms, pipelines, onshore facilities, vessel traffic, noise, and oil spills in the area between Point Conception and Point Arguello.

The existing leases have a moderate impact in the Proposed Sale Area due to the increased number of offshore platforms, pipelines, onshore facilities, the amount of vessel traffic, the noise in the area and the potential oil spills. The proposal does not significantly add to the impacts from these sources. The impacts are anticipated to remain moderate to the recreation industry in the region, unless one of the expected oil spills contacts the shoreline.

h. Impact on Tourism

i. Discussion: Impacting agents to tourism in Central California are described in Section IV.E.3.h. Oil spills, offshore structures, onshore facilities, pipelines, noise, and air quality are the main impacting agents to tourism. (The levels of impact and their definitions are given in Appendix A).

Oil Spills. Three large spills are expected to occur in the sale area as a result of the total development scenario. There is a small probability that one or more spills will contact the coast within 30 days (see Section IV.A.4). Although unlikely, the three spills occur within a short period of time and all three contact the mainland, a very high impact will occur to tourism in the sale area. If one or more spills contact either the Morro Bay or the Pismo Beach areas, a very high impact will occur locally and a high impact to the sale area.

If a spill contacts San Miguel Island, a low impact is expected to tourism in the sale area. If a large spill occurs and does not contact the shore a low impact will result to tourism in the sale area.

Offshore Structures. A moderate impact to tourism could occur if the potential 30 platforms are grouped directly offshore. If the platforms are relatively scattered throughout the sale area, a low impact to tourism is expected from the proposal.

Onshore Facilities. Onshore facilities are anticipated to have a very low impact on tourism as they are assumed existing, or to be constructed with similar facilities.

Pipelines. The two pipelines expected from the proposal will have a very low impact on tourism due to the low tourism in the areas of expected landfall.

Noise. Noise is anticipated to have a very low impact on tourism for the life of the field. However, a low impact can be expected locally during periods of construction.

Air Quality. Air quality is not expected to change significantly if controls are applied.

ii. Conclusions: The total development scenario is anticipated to have a moderate impact to tourism with very high impacts possible to any areas that are actually contacted by an oil spill. The exact amount of economic impact to recreation will vary for each possible contact point and time of year of contact.

iii. Cumulative Impacts. Impacts to tourism can occur due to other projects and existing leases in the area. The projects with the highest impact to tourism in the area are the Vandenberg Air Force Base expansion and the State Tidelands development. No tourism occurs at the beaches contained in Vandenberg Air Force Base due to the security of the installation. The State Tidelands development is planned for a secluded stretch of coast south of Point Arguello which is partly off Vandenberg and partly off private property. Tourism in this area is in the form of campers at Jalama Beach Park. A moderate impact is expected locally due to State Tidelands development.

Existing leases from Sale No. 53 would have similar impact on tourism as the State Tidelands development has on Jalama Beach Park. A similar impact would also occur at Surf and Point Sal. These areas of the coast are not large tourist centers, so although a moderate impact could occur locally, the remainder of the proposed sale area would have a very low impact on tourism.

The impacts from the proposal would be significant in that they would raise these impacts to moderate for the tourist industry.

i. Impact on Visual Resources

i. Discussion: Impacts to visual resources in Central California are described in Section IV.E.3.i. Offshore structures, oil spills, onshore facilities and pipelines are the main impacting agents to visual resources. (The levels of impact and their definitions are given in Appendix A.)

Offshore Structures. Potentially 30 platforms would be placed in the sale area as a result of this proposal. The impact from the platforms depends upon their positioning. A very high impact to visual resources could occur if all the platforms are grouped directly off the Morro Bay or Pismo Beach area. If the platforms are relatively scattered throughout the sale area, a moderate impact is expected for the entire sale area with localized high impacts to areas such as Pismo Beach.

Oil Spills. Three large spills are expected to occur in the sale area as a result of the total development scenario. If a spill does occur and contact the shoreline, a temporary degradation in visual quality will occur. This will be a very high impact to the local area. The scenic quality of the sale area is varied and impact levels will tend to vary depending upon which area a spill contacts, and which time of year the spill occurs.

Onshore Facilities. Onshore facilities are anticipated to have a very low impact on visual resources as they are assumed existing or to be constructed with similar facilities.

Pipelines. The two pipelines are anticipated to have a very low impact at their landfalls, and a low impact along their onshore right-of-ways.

ii. Conclusions: The proposed development is anticipated to have a moderate impact to visual resources over the proposed sale area with localized high impacts. The exact amount of degradation will depend upon the impacting agent and the nature of the shoreline that is impacted.

iii. Cumulative Impacts: Impacts to visual resources occur both onshore and offshore from other projects and existing leases. The other projects include the expansion of Vandenberg Air Force Base which will entail the construction of launch sites for the Space Shuttle and the expansion of the boat dock at the old boathouse at Point Arguello. This will be a low impact to the visual resources of the area.

State Tidelands development will cause a degradation of visual resources with the introduction of platforms into the State waters between Point Conception and Point Arguello. This is anticipated to be a low impact to the visual resources in the area. Existing leases will cause a low impact to the visual quality due to the placement of platforms in the Sale No. 53 area at the southern end of the Santa Maria Basin.

The proposal significantly adds to the impacts from these sources in that the proposal increases the anticipated impacts from low to moderate.

j. Impact on Cultural Resources

i. Discussion: Impacts to cultural resources in Central California are described in Section IV.E.3.j. Bottom disturbing activities, oil spills, onshore facilities, and visual intrusion of offshore structures are the main impacting agents to cultural resources. (The levels of impact and their definitions are given in Appendix A.)

Bottom Disturbing Activities. The potential 30 platforms, 800 development wells, and 506 miles of pipeline are anticipated to have a low impact to the cultural resources of the sale area, as most of the shipwrecks in the area occur close to land.

A moderate impact is anticipated from the pipelines where they come to shore.

Oil Spills. Three large spills are expected to occur in the sale area as a result of the total development scenario. Onshore cultural sites may be damaged during cleanup operations, and intertidal gathering areas may be fouled and become unuseable as gathering areas, if an oil spill occurs and contacts the shore. This would potentially be a very high impact at the local level and a moderate impact for the sale area.

Onshore Facilities. A very low impact is expected to the cultural resources in the area as most facilities required are already existing, or will be constructed with similar facilities. Since State and local jurisdictions onshore have primary authority over onshore development, it is assumed that their requirements for cultural resource protection will significantly reduce the likelihood of sites being disturbed or destroyed.

Offshore Structures. A low impact on cultural resources in the sale area is anticipated from the intrusion of the potential 30 platforms into the viewshed of the cultural resources in the area.

If all the platforms are placed off Point Conception, a high impact could occur due to the Native American spiritual concerns. However, due to the expected distribution of platforms at Point Conception, the expected impacts are moderate.

ii. Conclusions: The proposed development is anticipated to have a moderate impact to the cultural resources over the proposed sale area with localized potential high impacts from any oil spills that contact the shoreline.

iii. Cumulative Impacts: Impacts to cultural resources over the region occur both offshore and onshore from other projects and existing leases. The other projects include expansion of Vandenberg Air Force Base and the State Tidelands development. The Vandenberg expansion requires dredging at the old boathouse at Point Arguello, dumping of the dredge spoil offshore, and large onshore construction for roads, launch pads, and storage areas. All of these activities increase the potential impact to cultural resources. The State Tidelands development will have the same impacting agents as affect the OCS development, thus a low level of impact to cultural resources would be expected with development in State waters, except directly off Point Conception where a moderate impact would occur due to spiritual concerns of the Native Americans. The existing leases will have a similar expected level of impact in the region as the State Development.

The proposal significantly adds to the impacts from these sources in that the proposal increases the anticipated impacts from low to moderate with localized high impact occurring from potential oil spills.

k. Impact on Ports and Harbors

i. Discussion: The impacting agents that area associated with the proposal that may affect ports and harbors are: 1) additional vessel traffic (crew and supply boats, tankers); and 2) oil spills. The potential impacts that could occur as a result of these impacting agents are discussed in Section IV.E.3.k. This section should be read in conjunction with Section IV.O.3.d. An analysis of the impacts based on the total development case follows.

Additional support vessel traffic that is expected to occur as a result of the development of all resources is as follows: crew boats will be used to transport personnel to and from wellsites or platforms from Port San Luis, Gaviota, and/or possibly any of several existing bases in the Santa Barbara Channel. The rate of crew boat trips would be the same as that described for the Most Likely scenario discussion (see Section IV.E.3.k). Supplies taken to the wellsites or platforms could originate from Gaviota, Port Hueneme, and/or the San Francisco Bay area. The rate of supply boat trips would be the same as that described for the Most Likely scenario discussion (see Section IV.E.3.k).

Implementation of the proposal (total development) is expected to displace an amount of Alaskan North Slope (ANS) crude equal to the amount of proposal crude that is actually refined in California. This would proportionately reduce the number of trips made by tankers transporting ANS crude to the Ports of San Francisco Bay and Los Angeles-Long Beach. About 22.6 million bbls of proposal crude (total development) is estimated to be tankered to San Francisco refineries in the peak year. Currently, about 85 million bbls per year (CEC, 1983) of ANS crude goes to San Francisco. Thus, about 27 percent of the (present) ANS crude (annual) could be displaced (in the peak year), thereby reducing Alaskan tanker trips to San Francisco by a proportionate amount.

Additional support vessel traffic, expected to occur as a result of the implementation of this scenario, would be at the same rate as that described for the Most Likely scenario discussion.

Offshore structures in the proposed sale area that are anticipated to result from the implementation of Alternative I (total development) include 80 exploratory wells, 40 delineation wells, and 30 platforms with 800 development wells. An assumed to be existing marine terminal would lie just offshore Gaviota (see Section II.A.1.d). This marine terminal would require expansion to handle the total development scenario. An assumed to be existing supply boat base would exist at Gaviota. In the total development scenario, this supply base would be expanded, as would other existing supply bases in the Santa Barbara Channel. If additional space is required, it is expected to be in the San Francisco Bay Area. A crew boat is anticipated to be constructed at Avila Bay (Port San Luis) (or an alternate site that is approved by State and local planning jurisdictions). Additionally, consideration has been given to the expansion of existing or assumed to be existing ports in the Santa Barbara Channel. All expansions or modifications would be subject to review and approval of State and local planning jurisdictions. Based on the presence of 30 platforms and a 26-year production period, the statistically expected number of platform-large vessel collisions would be 0.4. Therefore, there is only a 60 percent likelihood that there would be no collisions between vessels and platforms over the lifetime of the proposal.

ii. Conclusions: Moderate impacts to marine traffic in the Central California and Santa Barbara Channel area would occur as a result of additional vessel traffic and offshore structures that are associated with total development. Moderate impacts to this resource category means that vessel conflicts occur frequently. Major rerouting of shipping traffic would not be necessary.

iii. Cumulative Impacts: Without the proposal, increases in marine vessel traffic and surface structures will result in more vessel-vessel and/or vessel-structure incidents. The increases were discussed in Section IV.E.3.1.iii. The cumulative effect of the increased activities could result in moderate impacts on vessel traffic. Implementation of the proposal (total development) is likely to shift the impact level on marine traffic from moderate to high. Since exploration, development and production activity is a significant impact-producing agent on marine traffic, the proposal (total development) is a substantial contributor to cumulative impacts on this resource category. Adoption of the recommended Coast Guard routine measures (see Section III.C.12) would greatly reduce the potential for the previously described impacts to occur.

Offshore infrastructure in the sale area that is expected to result from development of all resources includes 800 exploratory wells, 40 delineation wells, 30 platforms, 800 development wells, and 2 subsea completion systems. The assumed to be existing marine terminal offshore Gaviota (see Section II.A.1.d) would require expansion for the total development scenario. The assumed existing supply boat base at Gaviota would require expansion.

A total of 113 round trips per year from Gaviota (see Section II.A.1.d) to San Francisco is expected to be made in the peak year of production (1993) by a 27,000 DWT tanker in the total development scenario. A total of 23 round trips per year from Gaviota to the Gulf of Mexico (Galveston) is expected to be made in the peak year of production (1993) by three 45,000 DWT tankers in Alternative I (high case) (i.e., 69 total round trips). The expected impacts follow: Port San Luis (or an alternative site that is approved by State and local planning jurisdictions) - high (i.e., additional docks, berths, and facilities would be required); Santa Barbara Channel Ports, Port of San Francisco - moderate (i.e., moderate modification or expansion of existing facilities would be required, but major expansion or renovation would not be necessary). All expansion or modifications would be subject to review. The probability that a large oil spill from the combination of the proposal, existing leases, and import tankering will occur and contact Port San Luis is similar to that for the proposal alone (i.e., 13 percent in 3 days, 14 percent in 10 days and 30 days). For Morro Bay - 2 percent in 3 days, 3 percent in 10 days, and 6 percent in 30 days.

1. Impact on Marine Traffic

i. Discussion: The impacting agents that are associated with the proposal that may affect marine traffic are: 1) additional vessel traffic (i.e., tankers, crew and supply boats, geophysical survey vessels); and 2) offshore structures (exploratory rigs, platforms, and subsea completion systems). The potential impacts that could occur as a result of these impacting agents are discussed in Section IV.E.3.1. An analysis of the impacts based on the Total Development scenario is as follows.

A total of 113 round trips per year from Gaviota to San Francisco is expected to be made in the peak year of production (1993) by a 27,000 DWT tanker in Alternative I (total development). This is based on an estimated peak oil flow rate of 61,986 bbl/day. The total distance traveled in this peak year by these tankers would be 66,896. A total of 23 round trips per year from Gaviota to the Gulf of Mexico (Galveston) is expected to be made in the peak year of production (1993) by three 45,000 DWT tankers in Alternative I (total development) (i.e., 69 total round trips). This is based on an estimated peak oil flow rate of 61,896 bbl/day. The total distance traveled in the peak year by these tankers would be 607,200 miles.

Assuming an average of 70 tanker round trips per year, emanating from the western Santa Barbara Channel over the Proposed Sale No. 73 26-year production period (total development), the statistically expected number of tanker casualties would be 0.1. A total of 0.3 severe casualties are expected. The probability of casualities would be highest in the peak year of production (1993) when 182 tanker round trips are predicted. The total number of casualties in the peak year would be 0.01; for severe casualties, 0.003.

The estimated number of vessel accidents during exploration, development and production activities of the proposed sale should be low if U.S. Coast Guard policy is followed. Presently, this policy does not permit surface hydrocarbon operations (drilling) within Precautionary Areas, safety fairways, or vessel traffic lanes. In the event hydrocarbon operations are permitted within the proposed vessel traffic lanes and precautionary area in the southern Santa Maria Basin, potential impacts on shipping could be: high economic losses to the shipping and oil industries, loss of lives, and increased probability of a large oil spill. This would be due to the navigational hazard that would exist with structures in the routine areas.

m. Impact on Refineries

i. Discussion: The impacting agent that is associated with the proposal that may affect California refineries is sour (high sulfur) and heavy (low API) crude oil.

The Conditional Mean Resource Estimates for this scenario are 970 million bbls of oil in the unleased Federal lands within the sale area. Production of this crude is expected to peak in 1993 when annual oil production would be about 90.5 million bbls. Distribution of the Conditional Mean Volume of oil is the same as that described for the Most Likely scenario (see Section II.A.1.d).

California refineries are assumed to have the capacity and capability to process Sale No. 73 crude oil by the time it is piped or tankered to them (1987 is expected) (see Table IV.E.3.m-1). Twenty-five percent of the production is thought to be of such quality that it would be tankered to the Gulf of Mexico for refining. No new refineries are exected to be built as a result of this proposal. In the future, California refineries will need to make large investments in order to process low quality crude oil from past and future offshore California oil lease sales. At this time, these modifications appear to be economically feasible for the refineries (see Section IV.E.3.m). Alaskan North Slope crude would be displaced in an equal amount to the offshore California crude produced.

The proposal (total development) would represent a major contribution to the need for the refinery modifications, based on a peak production (1993) of 185,959 bcd. This major contribution to the overall inducement of refinery retrofitting is considered to be a moderate impact to refineries (see Chapter IX for a definition of all impact levels for this category). In the event that the proper permits for retrofitting cannot be obtained from State and local governments, or if retrofitting proves to be economically infeasible, then some of the crude production (in excess of the 25 percent anticipated) would need to be shipped to the Gulf of Mexico for refining. This would result in additional navigational conflicts and an increased potential for a large oil spill to occur.

ii. Conclusions: California refineries are assumed to have the capacity and would process all proposal-related crude that is piped or shipped to them (25 percent of the production would be tankered to the Gulf of Mexico for refining). The proposal (total development) represents a major contribution to the overall inducement of California refineries to make extensive modifications to the refining process to handle low quality crude. This is considered to be a moderate impact to California refineries.

In the event that California refineries are not able to process Sale No. 73 crude production, then some of the crude (in excess of the 25 percent anticipated) would need to be tankered to the Gulf of Mexico for refining.

iii. Cumulative Impacts: Impacts from total development would remain the same as discussed under the cumulative impact section for the most likely development scenario.

n. Impact on Offshore Structures

i. Discussion: The impacting agents that are associated with the proposal that may affect existing offshore structures are: 1) platform and pipeline installation activities; and 2) additional vessel traffic. The potential impacts that could occur as a result of these impacting agents are discussed in Section IV.E.3.n. An analysis of the impacts based on the total development scenario is as follows.

Subsea pipelines which are associated with marine terminals near Morro Bay and Port San Luis could be impacted as described in Section IV.E.3.n. However, it is unlikely that these impacts would occur. Therefore, no impacts are expected to existing offshore structures in the Santa Maria Basin. Structures in the Santa Barbara Channel include platforms, subsea completion systems, pipelines, an OS&T vessel, and exploratory rigs. Impacts to these existing oil and gas structures will occur in the Santa Barbara Channel as a result of additional vessel activity from the proposal (total development). A total of 113 round trips per year from Gaviota to San Francisco is expected to be made in the peak year of production (1993) by a 27,000 DWT tanker in the total development scenario. A total of 23 round trips per year from Gaviota to the Gulf of Mexico (Galveston) is expected to be made in the peak year of production (1993) by three 45,000 DWT tankers (total development) (i.e., 69 total round trips).

Additional support vessel traffic expected to occur as a result of the implementation of the total development scenario would be at the same rate as that described for the Most Likely scenario discussion. Crew boats would originate from Port San Luis, Gaviota, and various other existing or assumed to be existing ports/harbors in the Santa Barbara Channel. Supply boats would emanate from Gaviota, Port Hueneme, or possibly the San Francisco Bay area. Low impacts from this additional vessel activity are expected to occur to offshore structures within the Santa Barbara Channel.

ii. Conclusions: Impacts to existing offshore structures (platforms, pipelines, subsea completion system, OS&T's, etc.) will be confined to the Santa Barbara Channel, since the only existing platforms are in this area. Impacts will be due to small vessels contacting the platforms. These impacts are expected to be low (affected structures could be repaired, with little, if any, replacement; down-time would be only 1 or 2 days).

iii. Cumulative Impacts: Without the proposal, increases in vessel traffic and other hydrocarbon activities will result in more vessel-structure incidents. The increases were discussed in Section IV.E.3.n. The cumulative effect of the increased activities could result in low impacts on offshore structures in the sale area. Moderate to very high cumulative impacts could occur in the area of greatest hydrocarbon activity (i.e., Santa Barbara Channel). Implementation of the proposal (Total Development scenario) would likely shift impacts in the sale area to moderate to very high. Impacts in the Santa Barbara Channel would likely not increase, however, the potential for those impacts would increase.

Since vessel traffic and new surface structures are significant impact-producing agents on offshore structures, the proposal (total development) is a substantial contributor to cumulative impacts on this resource category. Adoption of the Coast Guard recommended routing measures (Section III.C.12) would greatly reduce the potential for the previously described impacts to occur.

o. Military Uses

i. Discussion: The military operating areas, activities, and impacting agents are the same as discussed in Section IV.E.3.o (most likely case). For the total development (conditional mean resource level), however, the placement of 30 permanent production platforms (compared to five for the most likely case) is predicted in the sale area over the production life of fields developed as a result of this sale. This is six times greater than the most likely, and would increase the impacts expected to military operations to very high (exclusive-use areas would have to be completely shifted, curtailed, or eliminated) from high for the Most Likely. This is the result of structure placement and the accompanying level of vessel traffic. Impacts from oil spills would increase to low (from none) as three oil spills are predicted.

ii. Conclusions: The overall impacts expected to military operations will be very high (exclusive-use areas would have to be completely shifted, curtailed, or eliminated; extensive alteration or reductions to military operations would be required) as substantial overlap of military operating areas and the Proposed Sale No. 73 area exists (87%).

iii. Cumulative Impacts: The cumulative impacts expected to military operations will remain very high (exclusive-use areas would have to be completely shifted, curtailed or eliminated). The existing leases in the Santa Maria Basin have all been stipulated, adequately mitigating any impacts to military operations. Other activities (see Section IV.E.3.o.) are not expected to affect the impact level.

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